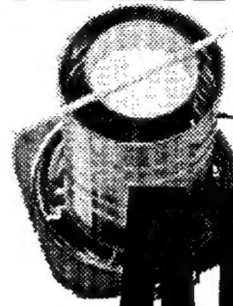
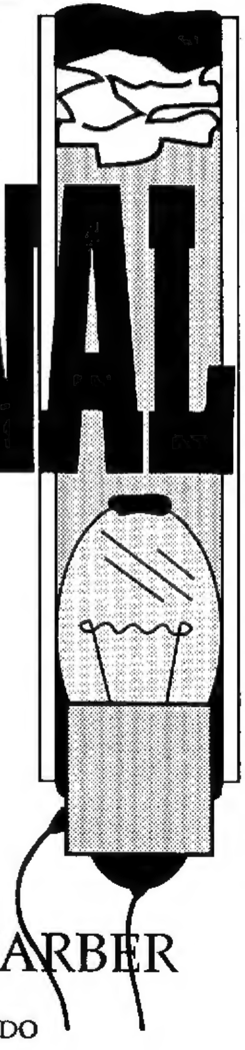
GUERRILLA'S ARSENAL





Advanced Techniques for Making Explosives and Time-Delay Bombs

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WARNING

The procedures in this manual and the resulting end product are *extremely dangerous*. Whenever dealing with high explosives, special precautions should be followed in accordance with industry standards for experimentation and production of high explosives. Failure to strictly follow such industry standards may result in harm to life or limb.

Therefore, the author and publisher disclaim any liability from any damages or injuries of any type that a reader or user of information contained within this manual may encounter from use of said information. Use this manual and any end product or by-product at your own risk. This manual is *for information purposes only*.

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— PREFACE

This book will be a departure from my previous works in that I will be working on the assumption that the reader knows little or nothing about working with explosives. This should not be construed as meaning that this book is for the uninitiated. Nothing is further from the truth. Explosives work is deadly serious business, not to be entered into lightly or for the sake of idle experimentation. My main reason for this approach is due to the varied levels of training I've run across in both civilian and military work. To put it bluntly, people who should have known better didn't.

Many years ago, while working on the demo range with the army engineers, I had an experience which may prove salutory. After setting up my shot, a 40-pound shaped charge, I went to the next set to examine the placement of a claymore mine. When I returned, I found that my NCOs had placed 40 pounds of C-4 under the shaped charge. When I asked them about it, they said that since the day was growing short, they needed to get rid of some surplus explosives.

EOD operators routinely use shaped charges to split the shells of high explosive bombs without (or at least with little chance of) detonating the main filler. I told them that if we went on with the shot, we would be picking up C-4 everywhere. Since they had the rank and "experience" on me, I was overruled.

After cranking off the shot, we waited the required period and went down to examine the damage. Our CO had arrived there ahead of us. He was holding a torn block of C-

4 in his hand and, to put it mildly, was not happy. We spent the better part of an hour policing up the place.

This episode taught me not to take anyone's experience for granted. It also taught me not to leave my shots unattended.

The main point, however, is that a book is not the best way to learn how to handle explosives. You wouldn't try to drive a car for the first time just because you had read the Driver's Ed handbook, would you? Perhaps in the near future it may be necessary for freedom fighters to learn from a book because of lack of anything else, but to do so when it is not absolutely necessary is foolhardy in the extreme. Use this book for familiarization and food for thought, unless you have the training, experience, and skills.

In an uncertain future, when firearms are outlawed or restricted to the "elite" (who rarely have problems with permits), homemade explosives may be one of the only methods of fighting back a people may have. Individual freedom seems to have taken some hard knocks lately by politicians whose only solution to problems is to pass more laws restricting the freedom of all because of the misdeeds of a few.

A good case in point is the "cop killer" bullet furor of a few years ago. Spurred on by a publicity-seeking congressman and a sensation-hungry media, the American public was led to believe that criminals were just waiting to acquire these bullets to gun down our police officers—no matter that the bullet in question had been on the market for almost 20 years and no officer had ever been shot with one. No matter that they had consistently been sold only to police departments (individual policemen couldn't even order them). No matter that the only way any of them had reached private hands was when some departments sold off their lots of old ammunition (a common practice). They were a *grave threat* to our very way of life.

The result? Another law infringing on individual freedom as well as an increase in police officer fatalities once the word got around that many officers wear body armor

(more of them were getting shot in the head). The only bright spot to the story is that the legislator in question was indicted and convicted on charges of extortion and obstruction of justice and served several years in a state institution (once again proving the existence of God).

The best way to avoid this book being needed by a future force is to take political action now. Let your legislators know how you feel about their actions. Constantly. Be a pain in the ass. Who cares if they find it annoying? They work for us, not the other way around. And if they continue passing laws to restrict individual freedoms, vote their self-serving asses into the unemployment line. And make sure the next guy or gal knows the reason they're gone. We still have this option, so use it. Or lose it.

I don't know of any present book that covers this aspect of explosives work from A to Z as I intend to. There *is* one book out there that purports to, but it is so full of holes and downright errors that it gives me the willies every time I see it. Yes, I do own a copy. I bought it back in the old days when any book on the subject was rare. Fortunately, I already had my military training and a couple years of civilian work under my belt. Most people don't. This is serious business, and the penalties for mistakes are also serious. You have been warned.

In my first books, I feel that I neglected a *very* important point in explosives work—SAFETY. You must be constantly aware of the potential dangers of the materials you will be making/using. Never become complacent or sloppy when handling explosives. While familiarity may not breed contempt, in this case it may breed carelessness. Never overlook the fact that you are dealing with materials which *demand* your respect. Forget that and you court disaster.

I have scars to remind me how painful complacency can be, as well as a 40-percent hearing loss and practically no sense of smell. I was lucky. Kurt Saxon, Professor Emeritus of Improvised Weaponry, lost all of the fingers on his left hand and was blind for several months. Countless others have been killed or maimed. Always use the proper safety

equipment and handling techniques. *Be careful!* We will be talking about safety again.

This warning, of course, does not apply if you are one of the last remaining adherents to Communism. By your embracing Marxist doctrine, you have proven yourself much more intelligent and sophisticated than a simple country boy like myself. You are fully capable of operating without regards to anyone's rules. Invite all of your friends over to watch while you build your weapons of justice against the capitalist oppressor. The smoking lamp is lit, and drinking/drug use is encouraged.

INTRODUCTION

> INFERNAL MACHINES—Contrivances made to resemble ordinary harmless objects, but charged with some dangerous explosive. An innocent looking box or similar receptacle is partly filled with dynamite or other explosive, the rest of the space being occupied by some mechanical arrangement, mostly clockwork, which moves inaudibly, and is generally contrived that, when it has run down at the end of a predetermined number of hours or days, it shall cause the explosive substance to explode.
>
> *Dick's Encyclopedia*, 1891

The "infernal machine," or time bomb, is, as I define it, a portable improvised explosive device that utilizes a time-delay mechanism and is usually in a disguised form. Most delay demolition devices used by today's armies do not really fall under this definition and, except for mention in a historical context, will be omitted. Also omitted are the useful, but in this case totally unsuitable, devices such as dried seed timers, tipping delays, water drip delays, etc. They are not usually portable within a concealed package and so also do not apply.

The criteria I have chosen for selection are as follows:

1. Portable.
2. Short set-up (activation) time.
3. Reasonably safe to transport and handle.

The six basic types of delay mechanisms are:

1. Pyrotechnical—Slow burning fuse and blasting cap devices.

2. Mechanical/Straight—Straight clockwork types common in the earliest time bombs and lead break switches.

3. Mechanical/Electrical—The clockwork delay with electrical connection, as has become common with underground and terrorist groups, the collapsing circuit, and the modified lead break (electrical) switch.

4. Chemical/Straight—These are the delays that use an acid or other corrosive material to penetrate a barrier and contact a reactive material to produce a flame or explosion for initiation.

5. Chemical/Mechanical—This type uses an acid or other corrosive fluid to eat away a wire restraining a cocked striker or firing pin. This method is commonly used in military "time pencils."

6. Electronic—Using a combination of electronic components such as resistors, capacitors, or microchips to achieve the delay. This includes modified commercial timers and clocks as well as straight electronic circuits.

What type of timer an operative uses depends on how accurate he needs the detonation to be. For example, if he wants to-the-minute accuracy, the countdown timer or digital alarm is best. If he needs it close, but within a few minutes is okay, the alarm clock delay is fine. If he wants it to explode some time after he is gone, then the collapsing circuit can be utilized.

The prime reason that such a wide array of devices is listed is simple—availability. It's always nice to be able to use a snappy digital timer, but circumstances may be such that all the bomber has to work with is a battered but functional old alarm clock. Or a couple of pinball machine relays. Or some gelatin capsules and sulfuric acid drain cleaner. Whatever. He needs to know how to use what he has on hand to make up a functional and reliable timer.

Another reason for using a variety of techniques is deniability—to avoid leaving a detectable pattern. A good

forensic bomb analyst can often determine the identity of a bomber (at least to the extent of recognizing previous work) by the type of timer he favors, how the explosive charge is assembled, etc. Abu Ibrahim's (leader and chief bomb maker of the Palestinian May 15 Group) bombs are so distinctive that FBI experts can tell his work at a glance. He uses the same type of timing circuit, the same brand of batteries, even the same type of packaging (he prefers certain brands of luggage). The only saving grace (from a deniability standpoint) is that they are *very* well packaged (see *Federal Bomb Intelligence*, pages 6 and 7).

The Swiss police, upon receiving a tip from an informer, searched a hotel room which was reported to contain one of Ibrahim's devices. Even though trained dogs were used, they found nothing and indeed felt they had been lied to. It was only after they were told specifically where the bomb was and how it was packaged that they were able to find it. Destruction of the carrying parcel was required, something which is rarely done unless *very* strong suspicion is aroused. This kind of makes the identification aspect irrelevant, at least in his case. All he cares about is whether or not it detonates, since his ass is usually safe from prosecution in some Middle East hole. Other bombers may not even have the luxury of being out of town when their bombs are used.

It is surprising what a good forensic scientist can tell from bomb fragments. The Pan Am 103 bombing, which had long been attributed to the PFLP-GC (Popular Front for the Liberation of Palestine—General Command), was recently revealed to be the work of Libyan intelligence (a contradiction in terms if there ever was one). The vital clue was a tiny piece of microchip, less than a quarter-inch square, which was traced to the manufacturer. Sometimes it doesn't take much if the clue in question is unique.

Dean Hicks, the individual who used a pipe-bomb mortar to assault the IRS's Fresno, California, headquarters, was apprehended in this manner. The sophisticated timer used to activate the mortar contained a heat sink that had been specially built for his employer, Ford Aerospace. Only

100 were made, and all but 14 were accounted for. The number of people with access to the part was also limited. Good investigative technique on the part of the FBI narrowed the field down to one person who had both access to the part and a severe case of the ass at the IRS—Dean Hicks. He confessed to the bombing—as well as to two others the FBI was unaware that he was involved in—after his arrest and interrogation. In both cases, the timers used were extremely sophisticated but utilized commonly available parts. Until he confessed, the FBI had no real leads. He is currently a guest of the federal authorities.

Richard Johnson was an electronics engineer who worked full time for the Northrop aircraft corporation. In his spare time, he was chief of R&D for the Irish Republican Army Bomb Command South. The IRA only has about a dozen true bomb technicians who design and build the actual devices for delivery by the ASUs (Active Service Units, the standard IRA cell of four people). The FBI credits Johnson with bringing the IRA into the twentieth century. During his 12-year association with the group, he replaced their old collapsing circuit timers with cheap and increasingly sophisticated electronics.

A small microchip was recovered from the scene of several bombings in Northern Ireland. The markings on this chip were traced back to its manufacturer, who reported that he had only sold a small lot to an electronics parts retailer in Massachusetts. A check at the store revealed that the chip had been specially ordered for one of their regular customers—Richard Johnson. This was the first step of a long and tedious investigation which culminated in Johnson's arrest and conviction.

CHAPTER 1 A BIT OF HISTORY

The origins of the infernal machine have been lost in history. One of the earliest references I could find was its use in Belgium in 1585. Four massive mines were floated down the Scheldt River to destroy an opponent's bridge. Each of the mines was built on an 80-ton barge and contained 7,000 pounds of gunpowder encased in masonry and heavy stones. Both a match rope (fuse cord) and clockwork delay fuzes were fitted to these monsters. One of the mines found its target, blowing a 200-foot gap in the bridge. All exploded, causing extensive damage in the vicinity.

Many people have heard of Mary, Queen of Scots, and how she was put to death in the Tower of London. What most people are unaware of is why she was executed—for ordering the assassination by explosives of her husband, Lord Darnley.

The English still celebrate "Guy Fawkes Day" each year to commemorate an attempted assassination by explosives, known as the "Gunpowder Plot." The aforementioned Mr. Fawkes and his co-conspirator, Roger Catesby, planned to blow up the English Houses of Parliament on November 5, 1605, when King James I was to be present. Spurred on by the hostile attitude of the government against Roman Catholicism, the plotters secreted many large barrels of gunpowder, tightly wrapped in chains, in the basement of the Parliament building. The plot was uncovered when one of the conspirators warned a friend not to attend on that day, and he alerted the authorities. This led to the arrest and execution of most of the group. A ritual search of the vaults beneath

the Houses of Parliament is now conducted before the opening of each new session (sorry, all you IRA types).

EARLY AMERICAN EFFORTS

On the American front, the infernal machine was not employed until the War of Independence. Many may know the story of the "Turtle," an early man-powered submarine developed in 1776 by David Bushnell of Connecticut. While an undergraduate at Yale, Bushnell worked on the problem of exploding gunpowder under water. He finally perfected a device using the flintlock firing mechanism from a musket and a clockwork that would detonate the gunpowder after a predetermined period of time. When the Turtle made its historic attack on the British 64-gun warship *Eagle* in New York harbor, it carried a mine containing 150 pounds of gunpowder and a 30-minute delay mechanism. Though the mission was a failure due to the copper sheeting on the *Eagle*'s hull that prevented the novice submariner from screwing the mine into place, it marked the first use of a submarine to attack a surface vessel and presaged modern submarine warfare.

Among the earliest organized users of infernal machines were the saboteurs of the Confederate Secret Service (CSS). Organized in August 1863 by Confederate Captain Thomas Courtney, the unit was a small band of hand-picked officers assembled under special orders to "be employed in doing injury to the enemy." This they did in spades. One of their biggest coups was the destruction of the Union Army supply base at City Point, Virginia, on August 9, 1864, in what was one of the biggest single explosions of the war.

Originally thought to be an unfortunate accident caused by careless handling of artillery shells by stevedores, the true cause of the explosion was not revealed until after the war—sabotage by CSS agent Captain John Maxwell. Maxwell designed and built a small clockwork "torpedo," disguised as a candle box, that contained 12 pounds of blasting powder. Through subterfuge, he had the bomb

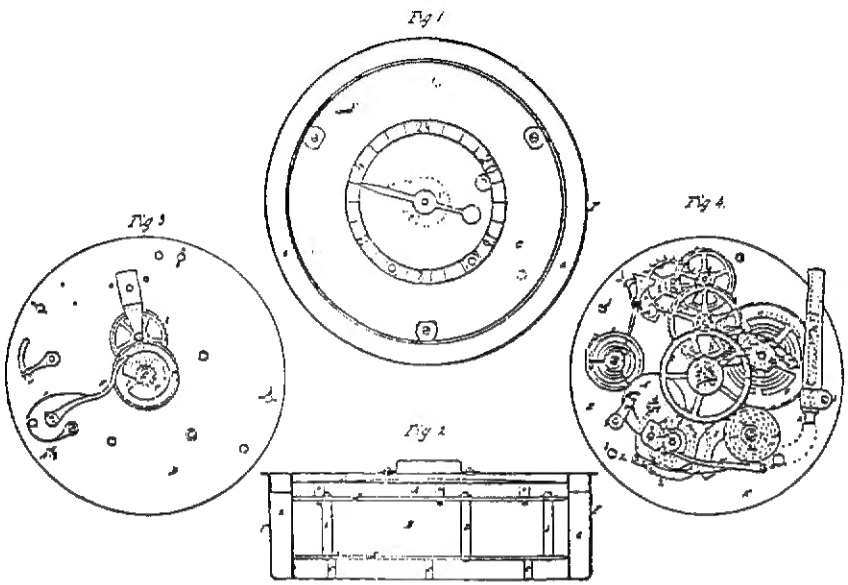
loaded on one of the ammunition barges as property of the ship's captain. The sentry on duty was told to put it below in a "safe place" until the captain returned. When the bomb went off, the damage was horrendous—58 killed, 126 wounded, and more than $4 million worth of damage. General Grant's nearby headquarters were practically flattened. Though the general was present, he was uninjured.

A separate unit under the command of Col. Robert Martin was given the task of burning New York City in retaliation for Sherman's burning of Atlanta. A dozen agents infiltrated the city in the weeks before Thanksgiving Day 1864 and set about reconnoitering their targets. The agents were equipped with another innovative weapon of the CSS—"Greek Fire." Believed to be a mixture of white phosphorous and turpentine, this volatile brew was carried in small 4-ounce bottles that were to be thrown against wooden or other flammable targets. Short exposure to the air caused the mixture to ignite spontaneously. Though a number of structures were fired, most notably P.T. Barnum's famous museum, the plot was a failure.

Another favored weapon of the CSS was the "coal torpedo," a small iron casting filled with explosive that closely resembled a lump of coal. Since coal-fired steam boilers were the primary suppliers of motor power during this time period, the uses to which such a device could be put are obvious. One was reportedly used in an assassination attempt on Union General Benjamin Butler and two other high-ranking officers while on board his luxurious steamer, *Greyhound*. On August 27, 1864, while on a short trip down the James River, the *Greyhound*'s boiler exploded, sending the ship to the bottom. While there were no human casualties, the general lost his prize horses in the incident.

No coal torpedoes are known to have survived the war, since the Yankees made it clear that "severe punishment" (a term which really meant something in those days) awaited anyone caught with such a device in his possession. Hanging or long imprisonment in the Dry Tortugas off the Florida coast was the usual fate of captured CSS officers, but luckily, most of the operational records of the various

units were destroyed in the bombardment of Richmond at the end of the war.



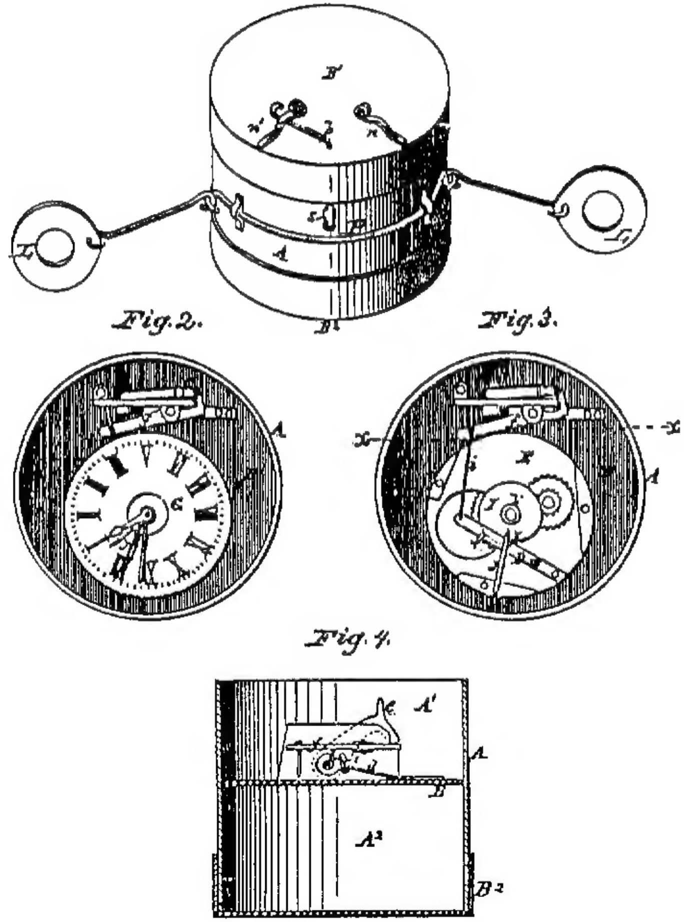
Nineteenth Century Clockwork Infernal Machine (circa 1863)

IRISH REPUBLICAN ARMY

The historical roots of the present IRA bombing campaign began on January 14, 1881, when a bomb was placed in a ventilating grid at Salford Barracks, Manchester. This was the first strike in a wave of bombings that were to terrorize England for the next four years. Two groups were operating semi-independently at the time—Clan Na Gael's "Revolutionary Directory" unit, led by William Mackey Lomasney (killed in 1884 during the attempted bombing of London Bridge) and O'Donovan Rossa's "Skirmishers."

Of the two groups, the Skirmishers were the more technically adept at improvisation (at least after a year or so of practice). They designed and manufactured an early chemical-delay fuze

that was quite advanced for its time. They also set up a "paint shop" in Birmingham which turned out close to 500 pounds of nitroglycerine before the operators were captured. This nitro was to have been soaked into sawdust as a homemade "lignine" dynamite (a common commercial dynamite). Clan Na Gael smuggled in commercial Atlas lignine dynamite from the United States and France, along with some ingenious mechanical detonators they had manufactured for their use.



Clockwork "Torpedo," circa 1876 (from Patent #173,017)

The difference between these men and the current crop of IRA bombers is the casualty count. Special pains were taken to ensure that as few people as possible were endangered. Most of the bombings were conducted in the dead of night, when traffic would be at its lightest. Even when they conducted their daring daylight triple bombing of the House of Commons on January 5, 1885, no one was killed. As of January of 1885, the conclusion of the "Dynamite War," more bombers had been killed in the preceding four years than private citizens (source: *The Dynamite War*, by Kenneth R.M. Short. Atlantic Highlands, NJ: Humanities Press, 1979).

GEORGE ELSER

There were numerous plots and conspiracies against the life of Adolph Hitler, but his erratic movements made any assassination attempts extremely difficult. All three of the serious attempts involved the use of time bombs. The first and, in my opinion, best attempt was by cabinetmaker George Elser on November 7, 1939. A private citizen who was alarmed by the Nazis' growing power and incensed by their conduct, Elser planned for over a year on the best way of dealing with *der Fuerher*. Careful study of the problem brought him to the conclusion that the one place where Hitler's presence could be guaranteed was the Lowenbrau restaurant in Munich on November 7. Every year since his release from prison, Hitler would meet with a number of the "Old Fighters" on this day to commemorate the ill-fated "Beer Hall Putsch" of 1923, which was his first attempt at gaining power in Germany.

In the early part of 1939, Elser procured employment at a quarry to obtain the explosives needed for the job, leaving several months later after he had acquired a sufficient supply. Moving to Munich, he began to frequent the Lowenbrau and even tried to buy a job there from a waiter he had befriended. When this failed, he decided to hide in the building until after closing time and accomplish his mission then.

Elser worked every night for more than a month prior to the celebration, hollowing out a wood-paneled stone and

cement pillar against which stood the podium where Hitler always made his annual speech. When he had cleared enough space, he packed the cavity with a charge consisting of about 50 pounds of Donarit (a commercial German explosive). Using two eight-day alarm clocks, he built a dual-primed mechanical detonating unit of great accuracy and reliability. He muffled the clocks and replaced the panel with great care to leave no signs of tampering. On the evening of November 6, he activated the timers by inserting a nail into a small hole in the panel which he had prepared for this purpose. He then headed for the Swiss border.

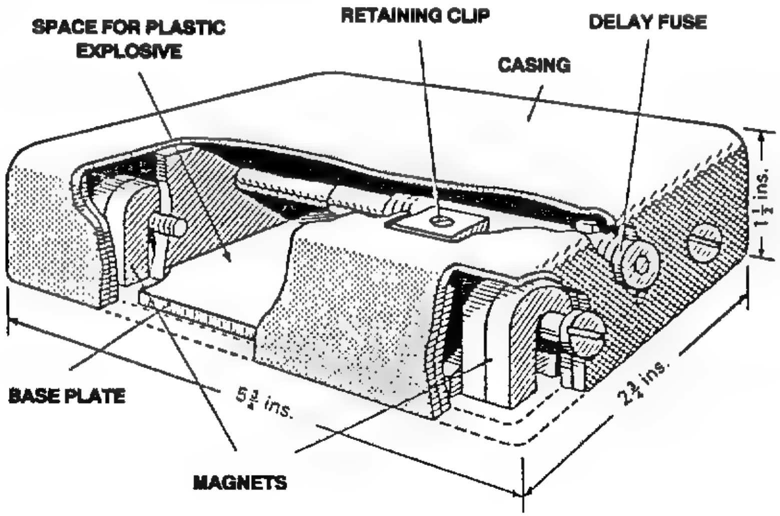
Due to bad weather, Hitler began his speech early in order to take his train back to Berlin that evening. Eight minutes after he left the building, the bomb detonated, blowing out the support pillar and dropping the better part of the ceiling on the spot where he had been standing. In all, eight Nazis were killed and about 60 injured.

Elser was arrested at the Swiss border when word of the attempt was received. He had in his possession technical drawings of explosive devices, parts of a detonator, and a Lowenbrau postcard. For all the care and meticulous planning he put into the actual bombing, he didn't put nearly as much into his escape. The Gestapo tortured him for several months, trying to get him to identify his confederates (in particular, two British intelligence officers the SS had kidnapped in Switzerland). Slowly it became clear that he really was working alone, and rather than risk negative propaganda from the show trial they had planned for him (or inspire possible copycats), they quietly shipped him off to the Dachau concentration camp. Elser remained there until April 1945, when the commandant of the camp received a secret communication from Heinrich Himmler—Elser was to be "accidentally" killed during the next Allied bombing raid. His body was cremated after the "accident" and his ashes disposed of.

OPERATION VALKYRIE

Probably the best known of the chemically fuzed infer-

nal machines was the one used by Claus Von Stauffenberg in his attempt on the life of Adolph Hitler on July 20, 1944. Operation Valkyrie (the code name for the assassination and coup d' etat which was to follow) involved several high-ranking army officers who wished to salvage the German nation from the ruin Hitler was leading it into. Rather than "rats deserting a sinking ship," as they have been characterized by their detractors, these officers were honorable military men who detested the Nazis and their excesses and had in fact been plotting Hitler's demise for several years. The bomb itself was composed of four captured British magnetic "clam" mines and had a combined explosive weight of 2 pounds. The mines were in two pairs, held together by their magnets and bound, one pair on top of the other, with adhesive tape, forming a bundle 3 x 3 x 12 inches.



British Model Magnetic "Clam" Mine (as used in Operation Valkyrie)

Stauffenberg had been severely wounded on the Russian Front early in the war, and his disability was such that he had to have a pair of pliers specially modified so that he would be able to crush the acid vial that activated the fuze. He had no right hand, and three fingers were all that remained on his left hand, so this operation was not as simple for him as it normally would have been. During a briefing at the "Wolfschanze," Hitler's secret headquarters in Bavaria, Stauffenberg placed the bomb under the conference table and, using a contrived excuse, made good his escape.

When the bomb detonated, four of those present were killed, and most of the others sustained moderate injuries. Hitler himself suffered only minor abrasions and flash burns to his legs. Even though the bomb was powerful enough to blow an 18-inch hole in the floor and did considerable damage to the room, it was insufficient to cause the death of its intended target. During the course of the briefing, Hitler had left the spot where he had been standing and went around the end of the table to consult a large wall map. The heavy oaken table supports partially shielded him from the blast.

The question as to why Stauffenberg used such a comparatively small charge of explosive in his bomb has puzzled experts for many years. Recently revealed documents have provided what may be the answer—the bomb Stauffenberg brought into the conference room that day was in reality only half of the charge he intended to use. His aide, Werner von Haeften, was carrying a second package in his briefcase which contained 975 grams of British plastic explosive, two detonators, and a 30-minute delay fuze. He and Stauffenberg were disturbed during the preparation and arming of the bomb and were not able to bring the two parts together. It seems unlikely that he would bring a large explosive charge into a place such as the Wolfschanze if he did not intend to use it. Stauffenberg apparently decided to take the chance with only the clam portion of the charge.

German experts at the scene believed that had the bomb gone off in a true bunker, without windows and possessing

strong walls to reflect the blast waves, everyone in the room would have been killed by the 2 pounds of high explosive the clams contained. If the second part of the bomb, which in effect doubled the explosive weight, had detonated, the same result would have occurred in the conference room.

Haeften threw the second part out of his car window as he and Stauffenberg were making their escape. A German Pioneer unit recovered it several days later. Not knowing that Hitler survived the blast, Stauffenberg sent word to the coup leaders, and phase two of Operation Valkyrie was set into motion. When it was learned that he was still alive, the Nazi security services moved to crush the rebellion, and the arrests and executions that followed effectively destroyed the German resistance movement for the rest of the war.

While Stauffenberg may be faulted for continuing the attack when he wasn't positive he had enough explosive to do the job properly, it must be taken into account that this was the third time he had brought a bomb into the Wolfschanze. His original intention was to try and kill Hitler, Himmler, and Goering in the same blast, effectively decapitating the Nazi hierarchy. If this had occurred, the success of the coup would have been virtually certain. On the first two occasions, Himmler never arrived, so he aborted the attempts. Stauffenberg finally decided to settle for Hitler alone, and he came quite close to succeeding.

Stauffenberg, the gallant soldier who had fought bravely and resolutely for his country, was ignominiously murdered by machine gun fire in a Berlin courtyard several days later.

MADISON, WISCONSIN: 1970

As everyone knows, the late 1960s were a turbulent time for America's campuses, and few more so than the University of Wisconsin at Madison. During a 15-month period, stretching from January 1, 1969, to April 15, 1970, the FBI catalogued more than 4,000 explosive and firebomb incidents occurring in the United States. Most of the explosive incidents involved

simple pipe bombs or, at most, three or four sticks of dynamite. That was the norm, at least, until WISBOM (the FBI code name for the incident). On August 24, 1970, the largest improvised bomb in U.S. history, containing over 1,750 pounds of explosive, was detonated next to the Army Mathematics Research Center at the Madison campus. This device was remarkable not only for its size, but, as subsequent investigation showed, in the utter ineptness of the bombers.

The "New Years Gang," as the underground press dubbed this hardy band of urban warriors (they preferred "Vanguard of the Revolution"), consisted of Karleton Armstrong, his younger brother Dwight, David Fine, and Leo Burt, all students or former students at the university. Over the course of the 1969-1970 school year, they were responsible for two firebombings and three explosive bombings, of which WISBOM was the only one to actually explode.

They began their campaign on New Year's Eve, 1969, with an aerial bombing of a nearby ordnance plant. Karl Armstrong, with his brother Dwight at the controls of a stolen Cessna 150, set out in the middle of a blizzard on their daring mission. Armed with two 1-gallon mayonnaise jars filled with ANFO, they flew over the plant at an altitude of 1,500 feet and tossed their "bombs" out the door. Not surprisingly, none of the three exploded. In his inexperience, Armstrong thought that the ANFO would explode on impact. Such is not the case.

Their second bombing attempt was directed at the power station that supplied the same plant with electricity. Karl Armstrong constructed a bomb by wrapping dynamite around a rolling pin, covering the ends with two pie tins, and wrapping the whole shebang with duct tape. (I still haven't figured out what he was trying to do, as he bought these items specifically for the bomb). The plan was to command-detonate the bomb, using a spool of wire and an auto battery he picked up for the attempt.

With his girlfriend as getaway driver, Karl set out in the dead of night toward his goal. After cutting himself rather badly while traversing the barbed wire fence surrounding

the target, he was placing the bomb at the base of a transformer when it fell apart. He was trying to put it back together when an employee at the station opened a door about 10 feet away to see what the noise was. He looked at Karl. Karl looked at him and smiled sheepishly. The employee slammed the door and raised the alarm. Karl dropped the bomb, vaulted over the fence, and made his escape.

The gang's final bombing, WISBOM, was the only time that all four of the individuals worked as a team. Borrowing the Armstrong family Corvair, Karl and Leo rented a U-Haul trailer (under their own names) and went to a fertilizer dealer in a nearby farm town to pick up the ammonium nitrate their bomb was based on. The dealer had no bagged AN in stock, so the boys had him pour the loose bulk AN into the trailer. They then drove their load to a nearby wooded area where they had stashed the stolen Ford Econoline van they would use to house the bomb. They shoveled the AN into a pile on the ground and loaded the six 55-gallon drums they had stolen from a construction site in town. These were taken to a filling station, partially filled with fuel oil, and returned to the staging area.

On the day before the bombing, all four of the principals went to the wooded area and prepared the bomb. They shoveled the AN into four of the drums and mixed it with the fuel oil. Each drum was primed with a stick of dynamite and tamped with clay. They included 20 or so gallons of leftover fuel oil in the load, creating sort of a giant Molotov cocktail.

Early on the morning of the bombing, the four conspirators collected the heavily laden van from its hiding spot and headed for Army Math. They discovered upon arrival that, instead of being deserted, the place was "lit up like a Christmas tree." Despite the fact that the building was obviously occupied, they decided to continue the assault. They believed that they would still be able to give sufficient warning to clear it safely.

The van was pulled into a loading dock, and the 10-foot-long fuse lit. The bomb went off shortly after 3:30 in the morning, destroying a large portion of the front of the

building. The warning never made it from the police station to Army Math. One young physicist, Robert Fassnacht, who was working late in the lab, was killed instantly. The bombers made a safe, if eventful, getaway, but were later captured and convicted.

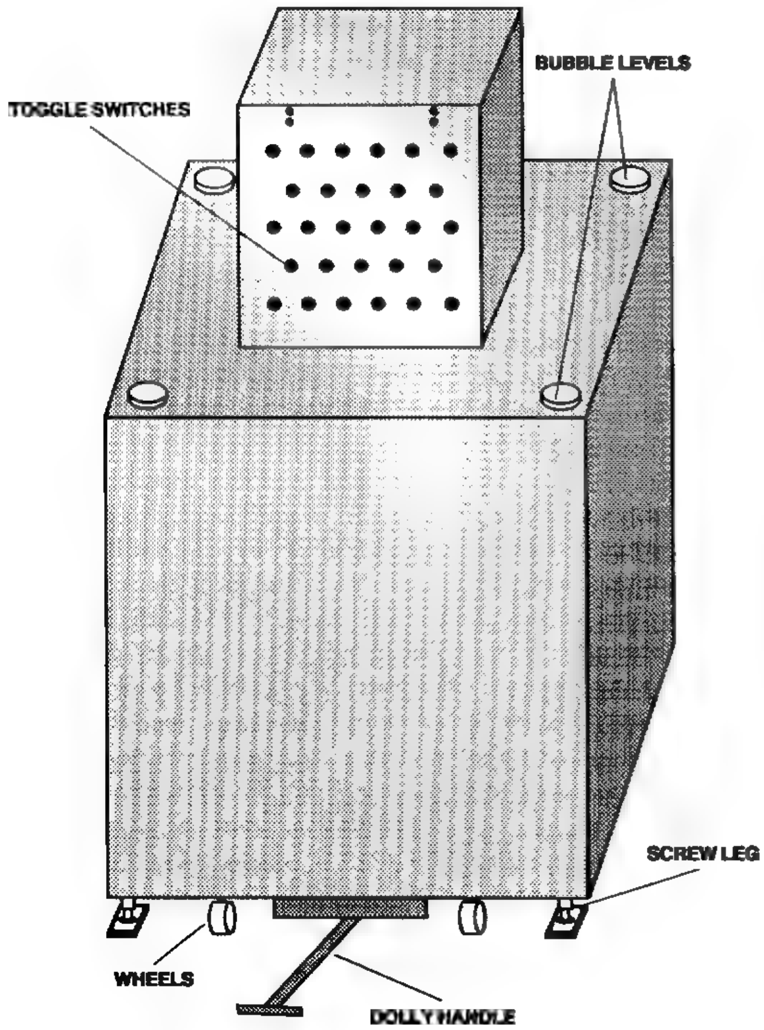
If anything positive can be said to have resulted from the Army Math bombing, it would be the effect it had on campus radicals in America. The large-scale destruction wrought, as well as the resulting death, gave the young firebrands pause to think and consider the possible consequences of their actions. The number of bombings that occurred after that morning in August 1970 steadily declined. It was as if the wind, quite literally, had been "blown" out of their sails (source: *Rads* by Tom Bates. New York, NY: Harper Collins, 1992).

OPERATION WHEELBOMB

The bomb that exploded at Harvey's Casino in Stateline, Nevada, on August 27, 1980, may not have been the most powerful in recent American history, but it was certainly the most sophisticated. The bomb, which had an estimated explosive force of 700 pounds of TNT, consisted of two metal boxes, mounted one on top of the other. The upper box measured 14 x 14 x 22 1/2 inches in size and contained most of the electronic firing circuit. Two banks of toggle switches were mounted on the front and back of the box, all neatly lettered. The lower box, which measured 24 x 26 x 45 inches, contained the explosive charge and additional circuitry. It was mounted on heavy caster wheels and was equipped with a dolly handle to facilitate movement. Each corner was equipped with an adjustable screw leg and bubble level to ensure that the bomb sat perfectly level.

The internal firing mechanism was truly a masterpiece of the bomb maker's art. According to the extortion letter that was found on the device, it was impossible for even its creator to disarm. Only by flipping the appropriate toggle switches in the proper sequence could the antihandling devices be disengaged to allow the bomb to be moved to a

safe area for detonation. It was not only equipped with a complex timer but seismic and mercury tilt switches as well. To put icing on the cake, a form of barometric pressure fuze would cause detonation if either of the boxes were pierced.



Harvey's Casino Bomb

Disarming was attempted by disruption of the mechanism using "controlled explosion" techniques, but the main charge detonated anyway, causing millions of dollars in damages but, thankfully, no casualties. The extortionists who planted the bomb were captured, convicted, and are now serving time for their crime.

This was one of the comparatively rare instances of a sophisticated "infernal machine" being used for criminal rather than terrorist purposes. One cannot help but admire the artistry and ingenuity that went into its creation.

CHAPTER 2

EXPLOSIVES—GENERAL

An explosive is a solid, liquid, or gas that, when subjected to extreme shock or heat, violently and rapidly converts into a gaseous form. In doing so, it releases heat and pressure equally in all directions. Explosives are classified as low, high, or primary, according to the detonating velocity or speed at which this change takes place, as well as their role in the reaction.

LOW EXPLOSIVES

Low explosives change from a solid to a gaseous state slowly over a sustained period of time (up to 1,300 feet per second). They are generally the easiest to compound in the field. The effect that occurs in low explosives when they are ignited is called "deflagration," which is essentially a very rapid burning rather than the detonation which occurs in high explosives.

Low explosives are initiated by a spark or flame. Because of the nature of their explosion, they must be heavily confined, as is a pipe bomb, to achieve optimum power. Unconfined, they produce a flash, a flame, and not much else (usually). One interesting exception is the low explosive made from half potassium chlorate and half sugar. When confined and ignited by a flame, it reacts as a low explosive, but when confined and initiated by a blasting cap, it detonates as a high explosive, albeit not an excessively powerful one. Other examples of low explosives are black powder, flash powder, and smokeless gunpowder.

HIGH EXPLOSIVES

High explosives change to a gaseous state almost instantaneously, at a rate of about 3,000 to 28,000 feet per second, and produce a shattering effect on the target. They must be initiated by a blasting cap or detonator. The effect that occurs in high explosives is called "detonation," which is essentially a high-velocity shock wave traveling from the point of initiation through the entire mass of the explosive. When a detonator that is too weak is used, or if the explosive mass is loose or degraded, a phenomenon known as "low order" detonation occurs, which is characterized by a comparatively quiet report, a lot of black smoke, and little target damage. When a detonator of sufficient power is used, a "high order" detonation occurs, which is loud, less smoky, and does tremendous damage to the target.

High explosives are most useful when high power is needed in a comparatively small package or when there's a "hard" target to defeat (i.e., most cases). Examples of high explosives are TNT and dynamite.

PRIMARY EXPLOSIVES

Primary explosives are highly sensitive compounds used in detonators and small arms primers. They are easily detonated by heat, spark, impact, and friction. Because of this sensitivity, they are only used in small amounts, usually less than a gram, in detonators. The volume is not much more than that of a pencil eraser. This small amount of explosive is used to initiate a larger charge of less-sensitive explosive, the "base" or booster charge, in a blasting cap. This base charge, in turn, has sufficient energy output to detonate the main explosive charge or, in some cases, the secondary booster, if an extremely insensitive explosive is used.

As you can see, the primary explosive is the "match" that lights a progression of increasingly less-sensitive explosives. This progression is known as the "explosive

train." Examples of primary explosives are HMTD, lead azide, and mercury fulminate.

EFFECTS OF EXPLOSIONS

Explosions are characterized by three main effects:

Blast

Blast waves are the high-velocity pressure waves that radiate outward from an explosion. Their pressure drops off in the open as the distance from the point of initiation increases. When this pressure wave encounters a solid object, such as a wall, it may be reflected. Depending upon the magnitude of the original wave, this reflected pressure wave may be two to nine times more destructive because its energy is more focused.

Blast effects are enhanced by confinement due to the reflecting of blast waves by the confining surfaces. A blast wave traveling through a tunnel, corridor, trench, or even a street decreases in intensity much more slowly than in the open. If a bomb detonates within a building, there is considerable reflection of the blast wave from the walls, even if they are demolished in the process. The rapid reflection of the wave from various walls, in such a case, results in a multiple punch effect on another wall. The overall effect of confinement is an increase in the radius of demolition of the explosive charge.

Incendiary

High explosives generate very high temperatures, often up to 3,000-4,000°C. Though the heat is intense, it is of such brief duration that they rarely start fires unless a lightly combustible substance is present. The large fireball seen in the movies and on TV is the result of the special effects crew lacing the charge with gasoline.

Fragmentation

A bare explosive charge has little in its form to produce

fragments, but it may pick up items from its surroundings and project them at high speed. Fragmentation is frequently thought of primarily as an antipersonnel effect, but it can also be very damaging to vehicles and equipment.

The "frags" can be generated by the use of a heavy metal casing on the explosive charge, or it can be a "surround," which is covering the outside of the charge with preformed fragments, such as ball bearings. Their size will depend on the nature of the target. Vehicles and equipment need heavy frags for good penetration, 3/8 inch being a good choice. The heavier the frag, the better its range and penetration. Small frags, such as BBs, are excellent for personnel. The South African armsmaker ARMSCOR has developed a bomb consisting of a high explosive charge encased in a fiberglass jacket. Cast within this jacket is a large number of spherical fragments of varying sizes. With such a variety of sizes, the bomb is better able to deal with different targets.

TYPES OF EXPLOSIVES

Low Explosives

1. Black Powder (BP)—Black powder is the oldest explosive and propellant known. It is a composite made from potassium or sodium nitrate, charcoal, and sulfur. It is used today as the core of time fuses, in some igniters, in fireworks, and in sport shooting as a propellant for muzzle-loading firearms. While BP is comparatively easy to formulate in the field, the resulting product is unlikely to exhibit the same level of power as the commercial article.

The standard formula is 75-percent nitrate, 10-percent charcoal, and 15-percent sulfur. The chemicals are powdered separately, mixed thoroughly, dampened with alcohol, and rubbed through a screen to produce grains. The resulting material is then dried for use. BP is comparatively safe to store and handle, but it must be protected from sparks and moisture.

Commercial black powder comes in various grain

sizes, which are graded from the largest to smallest as Fg, FFg, FFFg, FFFFg, and FFFFFg. The smaller the grain, the faster burning the powder. Naturally, FFFFFg is the best choice. It is usually used in flintlock firearms as a priming powder. Pyrodex, a commercial BP substitute, is interchangeable with black powder but leaves less fouling and grunge in the firearm.

2. Smokeless Powder (SP)—The term "smokeless powder" is somewhat of a misnomer, as it is neither totally smokeless or a powder. SP does produce much less smoke than BP and comes in the form of small granules of various sizes and shapes. It is used chiefly as a propellant in modern firearms.

Smokeless powder comes in two basic forms—single-base (SBSP), which is composed of nitrocellulose (guncotton) along with various stabilizers, and double-base (DBSP), which is of the same basic composition but includes a percentage of nitroglycerin to increase its power. Neither is particularly sensitive to moisture, but both must be dried before use if they become wet. They are also not as sensitive to spark and friction as black powder.

SBSP is mostly used in rifle cartridges, while DBSP is primarily for pistols and shotguns. DBSP is the best choice as a bomb filler, as it burns faster and generates higher pressures than SBSP. Due to its nitroglycerin content, it is possible to detonate DBSP using a strong detonator. To do so, it needs to be heavily confined, such as in a very sturdy pipe bomb. SBSP can be modified easily to increase its rate of burning and to make it detonable. It is generally understood that the faster the burning rate, the more powerful the blast.

3. Improvised Low Explosives—The most easily produced explosives are the low explosives. They are usually composed of a simple but intimate mixture of an oxidizer and a fuel. There are literally thousands of formulas floating around for low explosives, but I have included only a few of the better ones due to space restrictions. They are simple and powerful mixtures but must be handled with care, as all of them are sensitive to sparks and friction.

High Explosives

1. Nitroglycerin (NG)—Nitroglycerin has the distinction of being the first real high explosive. It is a thick oil, clear to pale brown, that detonates at a rate of about 24,000 feet per second. It is quite shock sensitive but is reasonably safe if handled intelligently. NG has the capacity to sense when a stupid or clumsy person is around and, if given a chance, it will try to kill him. Its sensitivity increases with the temperature, and when it gets above about 50°C it can become quite dangerous. Pure NG freezes at 56°F and is very insensitive when in that state. NG in the process of thawing, however, can be very sensitive.

Contact with nitroglycerin or its fumes can produce the most amazing headaches, which may be relieved by aspirin and strong coffee. The primary use of NG today is in commercial dynamites and double-based smokeless gunpowder. NG can be produced at home with a minimum of equipment.

2. Commercial Dynamite—The most common high explosive is commercial dynamite. Most dynamites, with the exception of military dynamite and Du Pont's "Tovex" series, contain nitroglycerin along with varying combinations of absorbents, oxidizers, antacids, and freezing-point depressants (see chart). Dynamites vary greatly in strength and sensitivity depending upon, among other factors, the percentage of nitroglycerin they contain. Dynamite is sensitive to shock and friction.

The main types of dynamite in commercial use are straight, ammonia, gelatin, and ammonia-gelatin. Straight dynamite consists of nitroglycerin and a nonexplosive filler. The percentage on the package corresponds to the relative amount of nitroglycerin contained in each stick. Ammonia dynamite is composed of ammonium nitrate and nitroglycerin. The percentage composition is computed the same way as for straight dynamite. Gelatin dynamite is a plastic dynamite with an explosive base of nitrocellulose dissolved in nitroglycerin. It is relatively insoluble in water. Ammonia-gelatin dynamite is a plastic dynamite with an explosive base of nitrocellulose dissolved in nitroglycerin with ammonium nitrate added.

Commercial dynamites can be detonated when primed with detonating cord or a No. 6 or larger blasting cap. Over a long period of storage, the nitroglycerin tends to settle to the bottom of the sticks. To prevent this from happening, dynamite cases should be turned over at frequent or regular intervals. Old dynamite or dynamite that has been stored improperly can be recognized by the oily substance collected on the casing or stains appearing on the packaging. The physical condition of the stick is also an indicator. The stick should be firm and resilient, like modeling clay. If it is soft or mushy feeling, it has gone bad. Dynamite in this state can be extremely sensitive and should not be used unless *absolutely* necessary. Due to uncertain supply lines in unconventional warfare, it might be necessary in some situations, but *extreme caution* must be used. Wetting the sticks liberally with acetone will make them safer to handle, bearing in mind that acetone is highly flammable itself.

A World War II British underground agent related an experience he had with "wet" dynamite. When he popped open a cookie tin that had been packed with dynamite, he had quite a surprise. Over the time of storage the dynamite had "leaked," and he found himself looking at a can of soupy nitroglycerin with a few dynamite wrappers floating in it. Though he had to use it in one shot, as he had nothing else, he reported it made a satisfying bang.

It has been said by some that gelatin dynamites don't leak, but this is not accurate. It just takes them longer to do so. Only Du Pont Tovex dynamites will not leak nitro, as the company no longer uses this as the explosive base. It has been reported by some users that the present base, monomethylamine nitrate, will leak and form a sticky coating on the cartridges, but this is only a nuisance and does not impair the explosive power or safety of the material.

When storing dynamites, never forget to turn the cases every 30 days or so. Make a note of the date turned on the case. Never store dynamite so that the cartridges stand on end. When NG-based dynamite freezes, it

becomes very insensitive to shock and requires great effort to detonate. Frozen dynamite may be recognized by trying to push a small nail through the stick. If much effort is required, the stick is frozen. In this case, it should be thāwed in a warm room, *never* by a fire. Thawing dynamite should be left strictly alone, as crystalline changes which occur during this process make it very sensitive until it is completely thawed.

The most common form of dynamite is the 1 1/4 x 8-inch cartridge or "stick," which weighs about half a pound. Consult the chart of the various Du Pont products for their cartridge size. Ordinarily, I would not list a specific commercial product, but since Du Pont seems to have the lion's share of the domestic explosives market, it will be the one you are most likely to come into contact with.

COMPOSITION OF MOST COMMERCIAL DYNAMITE

STRENGTH OF DYNAMITE, PERCENT	20	30	40	50	60	100
Straight dynamites:						
Nitroglycerin	20.2	29.0	39.0	49.0	56.8	
Sodium nitrate	59.3	53.3	45.5	34.4	22.6	
Carbonaceous fuel	15.4	13.7	13.8	14.6	18.2	
Sulfur	2.9	2.0	—	—	—	
Antacid	1.3	1.0	0.8	1.1	1.2	
Moisture	0.9	1.0	0.9	1.2	—	
Detonation rate (m/sec)	3,600	4,300	4,800	5,150	5,900	
Ammonia dynamites:						
Nitroglycerin	12.0	12.6	16.5	16.7	22.5	
Sodium nitrate	57.3	46.2	37.5	25.1	15.2	
Ammonium nitrate	11.8	25.1	31.4	43.1	50.3	
Carbonaceous fuel	10.2	8.8	9.2	10.0	8.6	
Sulfur	6.7	5.4	3.6	3.4	1.6	
Antacid	1.2	1.1	1.1	0.8	1.1	
Moisture	0.8	0.8	0.7	0.9	0.7	
Detonation rate (m/sec)	2,700	—	3,300	3,900	4,600	

STRENGTH OF DYNAMITE, PERCENT	20	30	40	50	60	100
Gelatin dynamites:						
Nitroglycerin	20.2	25.4	32.0	40.1	49.6	91.0
Sodium nitrate	60.3	56.4	51.8	45.6	38.9	—
Nitrocellulose	0.4	0.5	0.7	0.8	1.2	7.9
Carbonaceous fuel	8.5	9.4	11.2	10.0	8.3	—
Sulfur	8.2	6.1	2.2	1.3	—	
Antacid	1.5	1.2	1.2	1.2	1.1	0.9
Moisture	0.9	1.0	0.9	1.0	0.9	0.2
Detonation rate (m/sec)	4,000	4,600	5,150	5,600	6,200	7,400
Ammonia gelatin dynamites:						
Nitroglycerin	—	22.9	26.2	29.9	35.3	
Sodium nitrate	—	54.9	49.6	32.0	33.5	
Ammonium nitrate	—	4.2	8.0	13.0	20.1	
Nitrocellulose	—	0.3	0.4	0.4	0.7	
Carbonaceous fuel	—	8.3	8.0	8.0	7.9	
Sulfur	—	7.2	5.6	3.4	—	
Antacid	—	0.7	0.8	0.7	0.8	
Moisture	—	1.5	1.4	1.6	1.7	
Detonation rate (m/sec)	—	4,400	4,900	5,300	5,700	

NOTE: all percentages are by weight.

TOVEX SERIES DYNAMITES

NAME	CARTRIDGE DIAMETER (INCHES)	VELOCITY (FPS)
TOVEX 90	1-1 1/2	14,100
TOVEX 100	1-1 3/4	14,760
TOVEX 200	1-1 3/4	15,750
TOVEX 300	1-1 1/2	11,150
TOVEX 500 *	1 3/4-4	14,100
TOVEX 650 *	1 3/4-4	14,750
TOVEX 700	1 3/4-4	15,750
TOVEX 800	1 3/4-4	15,750
TOVEX T-1	1	22,000
TOVEX P	2-4	15,750
TOVEX S *	2 1/4-2 1/2	15,700
TOVEX EXTRA	4-8	18,700

* Small booster is required.

NOTE: Cartridge length varies, depending on the commercial application.

Du Pont has several other blasting agents of this family in production, such as Tovex C, Pourvex, and Drivex. These, however, are not in conventional cartridge (stick) form and usually come in 50-pound bags or are bulk loaded from special trucks. These would be found at large blasting operations.

Those listed as requiring a booster can be primed with about an ounce of a cap-sensitive explosive or one of Du Pont's Detaprime units. These look like small red rubber tubes, about the size of your finger, and are PETN based. If it were not for their inconvenient size and form, they would make nice little explosive charges on their own.

Large charges of explosives such as the three mentioned above or ANFO, ANFO-P, or ALUVITE (Du Pont's bulk ammonium nitrate-based explosives) need more powerful boosters like HDP-1 or HDP-3. These are 1- and 1/3-pound (respectively) cylinders of cast Pentolite (PETN/TNT) and are outstanding little explosive charges. They are one of the most powerful and stable of commercial explosives and are in fact 35-percent more powerful than TNT. Anti-Castro Cubans have long used them as a source of military-quality high explosive for their mines and various other devices. Tony Questa and the boys of Commando L used a mine containing 52 pounds of Pentolite from this source to sink the Russian freighter *Baku* off the north coast of Cuba in 1963.

Tovex dynamites are temperature-affected in respect to sensitivity. They are easier to detonate at higher temperatures, while at lower temperatures a larger booster charge is required. At *no time* do they become so sensitive as to be unsafe (this refers to *atmospheric* temperature, of course). For more details on these products, consult *The Blaster's Handbook*, published by Du Pont, which covers 90 percent of all commercial blasting.

As a final note, Du Pont manufactured a product years ago called "Pelletol." Pelletol is pure TNT in prill (pellet) form and is outstanding for use in primers or cast-loaded ordnance. It has been out of production for a while and is hard to find.

3. Military Dynamite—Military dynamite is a medium-velocity (20,000 feet per second, or fps) blasting explosive that is packaged in standard dynamite cartridge waxed paper wrappers. It has been standardized by the U.S. Army for use in general military construction work, such as quarrying and service demolitions. It is equivalent in strength to 60-percent commercial dynamite. Its composition is as follows:

75-percent RDX
15-percent TNT
5-percent SAE 10 motor oil and plasticizer
5-percent cornstarch

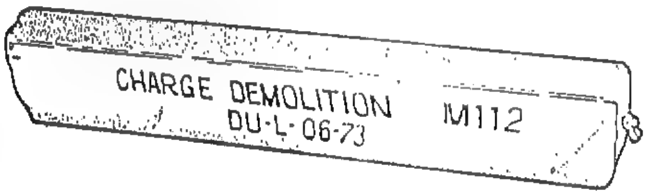
Military dynamite is much more stable in storage than the commercial variety since it contains no nitroglycerin or other liquid explosive, and it is usable over a wider range of temperatures. It may be used as is, or the RDX and TNT may be extracted for use in more interesting compounds such as homemade plastic or sheet explosives.

This extraction may be accomplished by removing the wrapper from the stick and soaking the explosive composition in about a quart of gasoline per stick. Stir the mix to make sure that any lumps are broken up and let sit overnight. The gasoline will dissolve the oil and plasticizer and, possibly, the cornstarch as well. Filter the crystals out and wash out the filter with more gasoline. Dry in a *well-ventilated* area before use. The resulting crystals will be about 84-percent RDX and 16-percent TNT. The crystals may need a final wash in cold water if there is any cornstarch left on them. This is sometimes hard to tell by sight, but if the explosive is weighed carefully both before and after extraction, it is easier to determine.

Military Explosives

1. Composition C-4—This is an extremely powerful plastic explosive used by the U.S. military. It is white in color and resembles nougat candy. Composed of RDX and various plasticizers, it is very stable and has a detonating velocity of 26,300 fps. C-4 comes packaged in 2 1/2-pound or, most commonly, 1 1/4-pound bars.

C-4's main advantage is not its plasticity so much as its power. It is 34 percent more powerful than an equal weight of TNT. When cold it is somewhat stiff and difficult to work with. This may be remedied by warming it in a warm room or, if the user is in a hurry, by placing it in a sealed plastic bag in warm water. In its softened condition it is easier to load into containers. C-4 should *not* be heated over a fire! If it catches fire, it burns with high heat. If you try to put it out, it may very well detonate. C-4 requires a special military blasting cap to ensure detonation, but two No. 8 commercial caps will work if necessary.



Composition C-4 Plastic Explosive

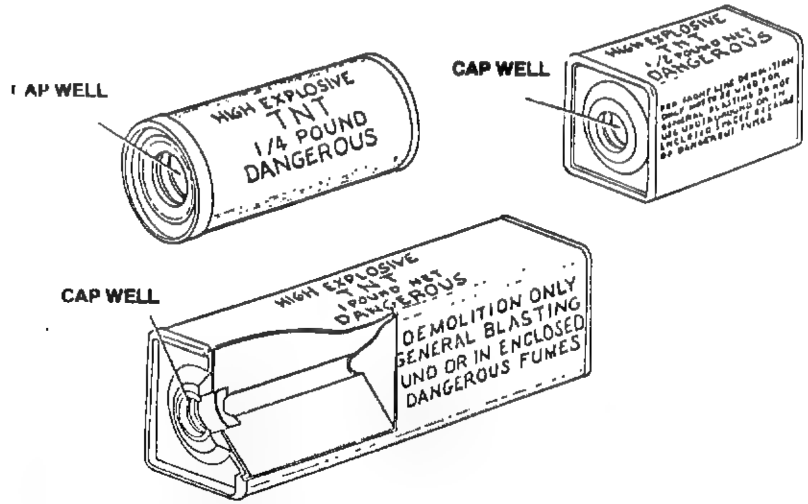
Older blocks of C-4 are dull gray and packed in clear mylar-film containers. Recent blocks are white and packed in olive-drab containers. Each block has an adhesive strip on the back. Weight is 1 1/4 pounds.

2. TNT—TNT is one of the most common military explosives in the world. In some areas it is used as a commercial explosive. It is a yellow crystalline solid with a detonating velocity of 22,000 fps. TNT is generally found in pressed blocks of various size.

As TNT has such a low melting point (80°C), it may be melt-loaded into ordnance by carefully heating it in a double-boiler, but this should be done with extreme caution. Liquid TNT is as sensitive to shock as nitroglycerin, so it must be handled with care until it has solidified. It may be powdered by placing it in a heavy canvas bag and pounding it with a wooden mallet. When powdering TNT, a dust mask and gloves should be worn, as TNT dust is highly toxic and may cause dermatitis in some individuals.

Powdered TNT in an improvised double boiler.

Crystalline TNT, which is more sensitive to initiation than pressed or cast, may be made by dissolving TNT in as little acetone as possible, then pouring the solution into a large amount of water. The TNT will precipitate out and may then be filtered and dried. TNT in this form has a lower detonation rate than either pressed or cast. It may be used as a booster for the other two forms if weak blasting caps are all that are available. A No. 6 cap will initiate crystalline TNT, while pressed TNT requires a No. 8, and cast requires a special engineer's cap or a booster.

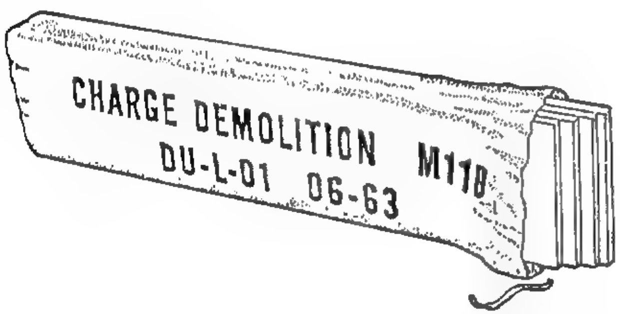


TNT Block Demolition Charges

TNT is issued in three sizes. The 1/4-pound block is issued in a cylindrical waterproof cardboard container. The 1/2-pound and 1-pound blocks are issued in similar rectangular containers. Each of these charges has a metal end cap with a threaded cap well in one end.

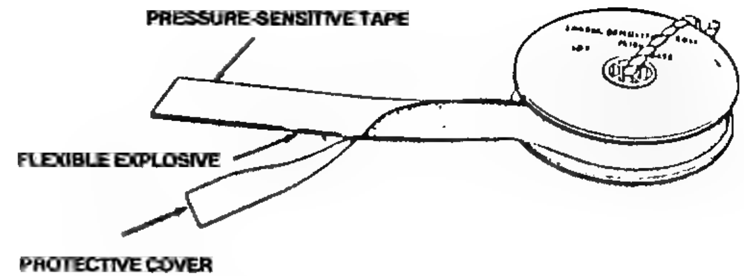
3. Picric Acid—One of the earliest military high explosives, picric acid has fallen into disuse in recent years. This is due mainly to its tendency to form sensitive compounds called "picrates" when in long contact with most metals. It is, however, fairly easy to make using common materials. It is slightly more powerful than TNT and has a detonating velocity of 23,300 fps. It too is a yellow crystalline solid.

4. PETN—PETN is a sensitive and powerful high explosive. It is used alone as the core of detonating cord or as the base charge in blasting caps. PETN is also used in composites with other explosives such as TNT (Pentolite, used in commercial and military boosters and burster charges) or with plasticizers in the flexible explosive charge known variously as Flex-X, Detasheet, or M-118 (military).



M-118 Sheet Explosive

M-118 demolition charges weigh 2 pounds (four 1/2-pound sheets) and are olive drab in color. There is an adhesive strip on the back of both the complete package and individual sheets. WARNING: M-118 should always be cut with a sharp steel knife on a nonsparking surface. The use of shears may cause premature detonation.



M-186 Roll Demolition Charge

This is an identical explosive to the one used in the M-118 charge, except that instead of a sheet, it is in a 50-foot roll. The M-186 has the same adhesive backing as the M-118. WARNING: M-186 should always be cut with a sharp steel knife on a nonsparking surface. The use of shears may cause premature detonation.

5. RDX—RDX is one of the most powerful explosives in military use. It is comparable in power to PETN and nitroglycerin, though it is slightly less sensitive than the former and considerably less sensitive than the latter. It is used alone as a base charge in blasting caps or—when desensitized or mixed with other explosives, such as TNT—as a booster or demolition explosive. It is the main component in the excellent C-4 plastic explosive and most other main-charge high explosives in current use.

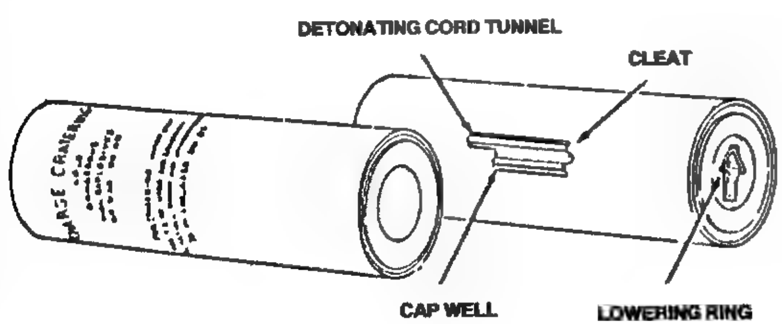
6. Tetrytol—Tetrytol is a mixture of the high explosive tetryl and TNT. It is very powerful, about 24-percent more powerful than straight TNT. It is little seen nowadays but may still be in use with the U.S. Navy, where it was (is?) used as a demolition charge. I only mention it because you may run across some.

7. Ammonium Nitrate (AN)—Ammonium nitrate is one of the least sensitive explosives and must be initiated by a powerful booster charge to be detonated successfully. Because of its low sensitivity, AN is used widely in composite explosives where it is combined with a more sensitive and generally more powerful explosive. AN should always

be packed in airtight containers, as it is extremely hygroscopic (absorbs water from the air). When wet, it is next to impossible to detonate.

Ammonium nitrate is widely available as a fertilizer and is quite cheap. It is not suitable for cutting or breaching charges due to its low detonating velocity (8,900 feet per second). Because its low velocity produces a heaving rather than a cutting effect, and because of its low cost, it is chiefly used in cratering and ditching charges, although its usefulness is not limited to these. Large containers of AN-based explosives make excellent blast bombs.

The U.S. Army uses a 40-pound AN canister as a cratering charge. This charge is sometimes hard to detonate, even though its middle section contains a 10-pound TNT booster. This TNT booster charge can be acquired by carefully punching a hole in each end of the canister and pouring water into the ammonium nitrate. After an hour's soak time, the ends can be cut open safely and the AN washed out to get to the more powerful TNT. We will revisit this versatile material later in the book.



40-Pound Ammonium Nitrate Demolition Charge

This is the standard cratering charge of the armed forces, but it can also be used in destroying buildings, fortifications, and bridge abutments. Ammonium nitrate absorbs moisture; when wet, it is impossible to detonate. Charges that have been punctured or otherwise show water damage should not be used.

U.S. MILITARY EXPLOSIVES

Nomenclature	Explosive	Weight	Size inches	Velocity of detonation	Relative effectiveness
Charge, Demolition: Block (TNT)	TNT	1/4 lb. 1/2 lb. 1 lb.	1-1/2 D x 3-1/2 L 1-3/4 x 1-3/4 x 3-3/4 1-3/4 x 1-3/4 x 7	22,600 fps	1.00
Charge, Demolition: M 112 block	Comp C-4	1-1/4 lb.	1 x 2 x 11	26,400 fps	1.34
Charge, Demolition: M 118 block	PETN or RDX based	Block: 2 lbs. Sheet: 1/2 lb.	Block: 1-1/4 x 3-1/4 x 12-1/2 Sheet: 1/4 x 3 x 12	23,600 fps	1.14
Charge, Demolition: M 186 roll	PETN or RDX based	25 lbs. (1/2 lb./ft.)	1/4 x 3 x 50 ft.	23,600 fps	1.14
Charge, Demolition: Ammonium nitrate	Ammonium nitrate with TNT booster	43 lbs.	7 D x 24 L	11,000 fps	0.42

ACQUIRING EXPLOSIVES

The primary method of acquiring commercial and military explosives is to raid the enemy's storage bunkers. Because of the increased security that will be imposed in the wake of such raids, it is best to try and take as much as possible and immediately disperse it into many scattered storage areas for future use. *Always* have storage depots ready beforehand.

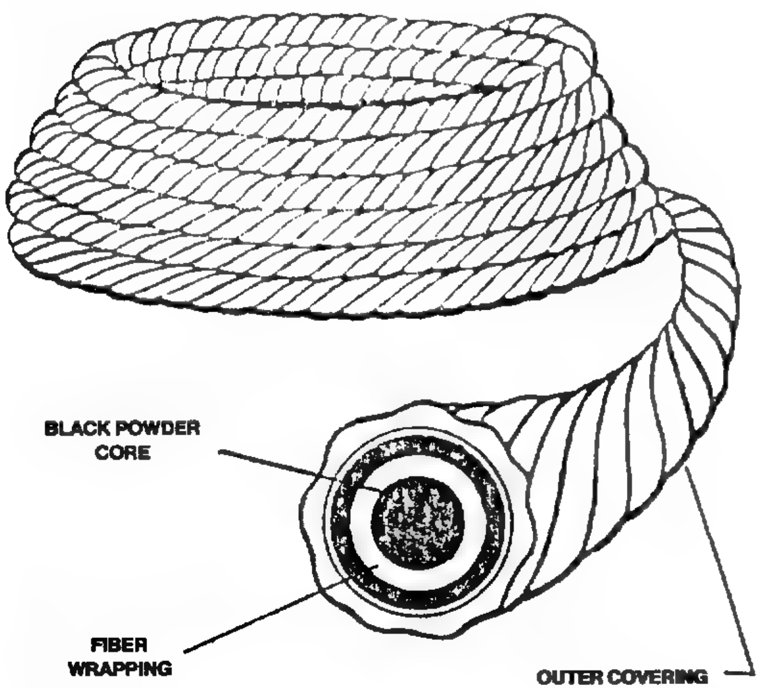
In the 1930s, the IRA raided an ammunition storage depot in Northern Ireland and carried off more than 3 million rounds of small arms ammunition. The problem was that they never anticipated such a haul and therefore had no place to hide it. All but a small amount was recovered by British security forces.

When large bombs are to be used, always try to base them on a cheap and easily available compound such as ANFO or CO-OP sugar so as to stretch the supply of more powerful and stable explosives.

BLASTING SUPPLIES

The following are the necessary items to initiate an explosive charge. Most commercial and military items can be interchanged, except where noted.

Safety Fuse



Safety Fuse

Safety fuse is basically a hollow tube containing a black powder core. It is made to burn *internally* and transmit flame at a continuous and uniform rate. The outer covering is generally made of a braided textile material which is waterproof. However, the junction of the fuse and initiator (blasting cap or squib) must also be waterproofed and the free end (the end that is lit) protected from moisture. The color of the fuse will vary with the manufacturer, as will the burning rate. Most burn at from 30 to 45 seconds per foot. The burning of a length of fuse should always be timed before using with explosives to determine the burning rate. Safety fuse usually comes in 50-foot rolls. It is possible to improvise fuse, but frankly, I've never seen one I would bet my life on—which is, of course, what you would be doing.

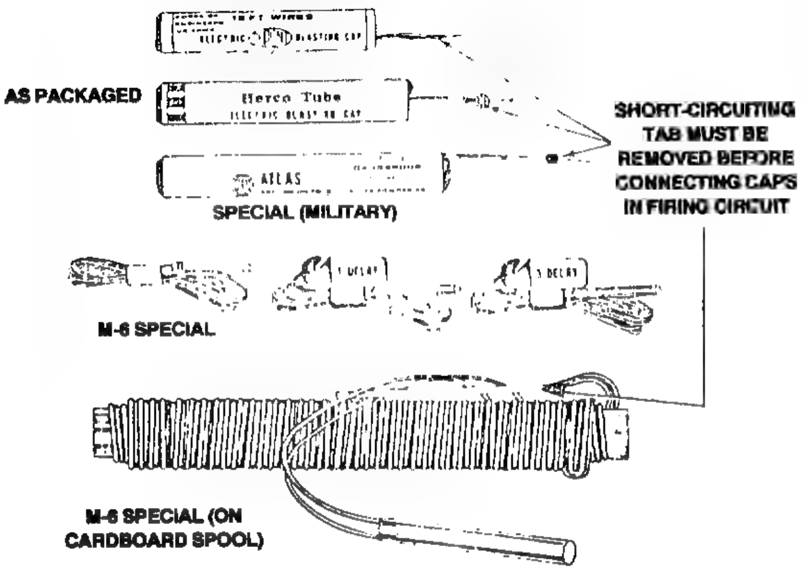
Blasting Cap

The blasting cap or detonator is a small metal tube about .25 inch in diameter and from 1.5 to 2.5 inches long. Contained inside is a "base charge" of a powerful high explosive such as RDX or PETN and a "cover charge" of a flame-sensitive primary explosive such as mercury fulminate or lead azide. The flame from the safety fuse or electric igniter sets off the cover charge, which detonates and sets off the more powerful and less sensitive base charge, which in turn detonates the main explosive charge.

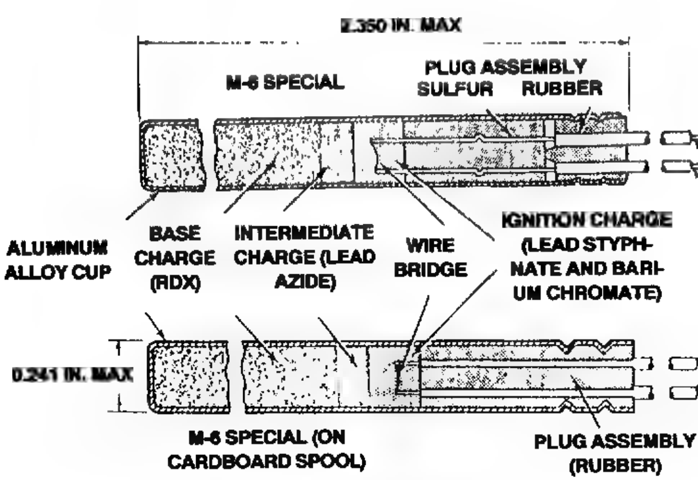
Blasting caps come in two basic types—electric and nonelectric. Nonelectric caps are hollow tubes containing the cover and base charges. They are open on one end to receive the safety fuse. Electric caps are basically the same as nonelectric, but the open end is sealed shut with a plastic or rubber plug. This plug contains the "bridge wire," which heats rapidly when electrical current is applied to it and ignites the primary explosive. Its function is identical to that of the filament in a light bulb.

Attached to the bridge wire and protruding from the plug are the two "leg wires." Their length varies, but 12 to 15 feet is most common. The leg wires are attached to the source of electrical power for firing. The ends of the wires are closed with a small metal tab called a "shunt." This prevents the cap from

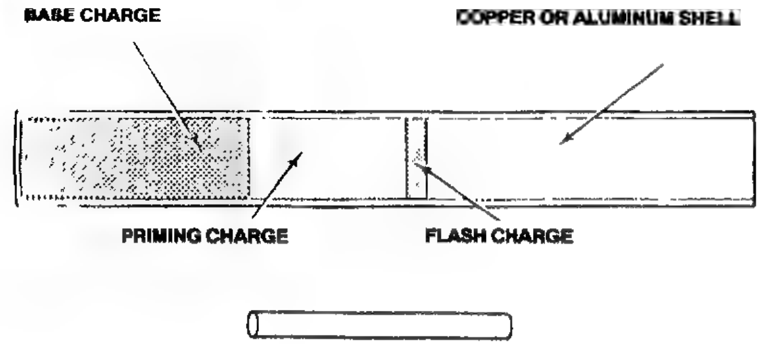
picking up extraneous electricity, either from static or radio waves, which could cause premature detonation.



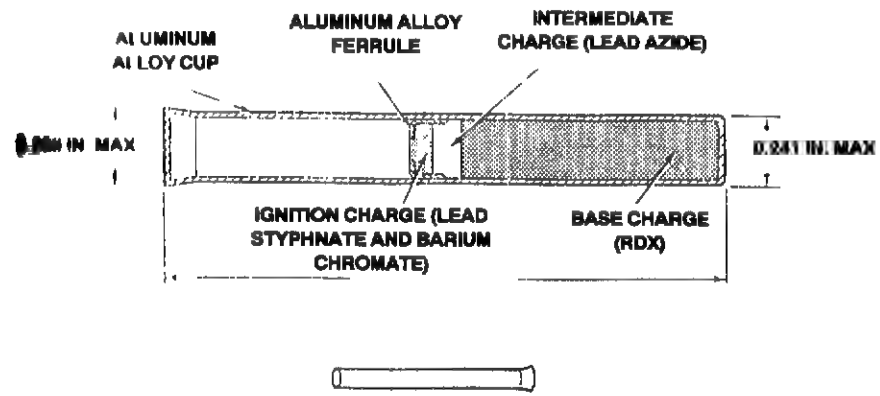
Electric Blasting Caps



Internal View of M-6 Special



Nonelectric Blasting Cap—Commercial #8



Nonelectric Blasting Cap—Special M-7 Military

Blasting caps should be handled with care due to the sensitive primary explosives they contain. If they are crushed or banged about, they are likely to explode. They must also be protected from heat or prolonged exposure to direct sunlight.

Blasting caps are manufactured in several strengths, the most common being the No. 6, No. 8, and Special Military. Each is about twice as powerful as the preceding cap. The No. 6 will detonate common dynamites but not military explo-

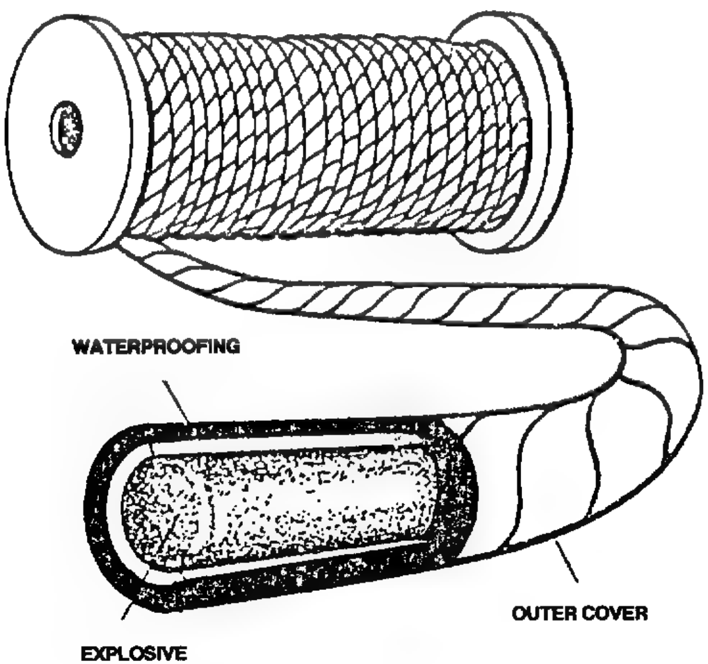
sives. The No. 8 will detonate *pressed* TNT such as military demolition blocks but not cast TNT. The Special Military cap will detonate any explosive that can be detonated by a blasting cap and was especially made for plastic explosives.

Another type of cap is the "delay" cap. This is used in commercial blasting and contains a delay element of from milliseconds to several seconds. It may be used as a regular cap, but the length of delay must be taken into account if split-second timing is required.

Blasting caps are packed in boxes of 50 or 100.

Squibs

A squib is a small metal tube that resembles a blasting cap. It contains a small black powder charge and was used to ignite black blasting powder. It is rarely seen nowadays, but one may be improvised.



Detonating Cord

Detonating Cord

Det cord is a hollow plastic tube similar to safety fuse in appearance. Instead of black powder, det cord contains a core of the high explosive PETN. This core doesn't burn but instead detonates at a rate of about 20,000 feet per second. It is used to connect charges of explosive for simultaneous detonation. It must be initiated by a blasting cap.

Det cord as is has little real utility in the construction of improvised explosive devices, but if the outer covering is split and the white crystalline PETN core removed, it may be used to make improvised blasting caps or plastic explosives. Det cord comes in spools ranging from 50 feet to 1,000 feet in length.

RULES FOR STORAGE AND HANDLING OF EXPLOSIVES

The rules and laws governing the safe storage of explosives are mostly inapplicable in an unconventional warfare context. A separate explosives magazine—weatherproofed, dry, and well-ventilated—is almost impossible to maintain when secrecy is of paramount concern. The use of a basement or other underground storage is a good alternative. The important point is that the explosives be kept cool, dry, and safe from unauthorized persons. If commercial dynamite is stored, it must be readily accessible so that the cases may be turned every 30 days.

Military explosives may be buried for long-term storage, providing the containers are stout, waterproof, and otherwise able to withstand the ordeal. The stores may be broken down into tactical loads, containing only as much as will be needed in a given time period. In this case, the necessary fuzes and detonators should be stored in the same package, or at least nearby.

It has been a long-time cardinal rule of both military and civilian blasters never to store detonators and explosives together. In unconventional warfare it is sometimes necessary to violate this rule. The dets could be stored in one end of the container loosely wrapped inside a piece of heavy

metal pipe with open ends and covered with a sandbag. This will help prevent a detonation wave from propagating should they go off. Once they are removed from storage, segregation should once again be practiced.

Handling Explosives Checklist

- Never handle explosives in a careless manner.
- Never smoke or allow open flame in the presence of explosives or detonators.
- Never store metallic tools with explosives (spark hazard).
- Always try to use up older stocks of explosives first.
- Never permit cases of explosives to rest on the floor. Place them on boards or pallets to allow the air to circulate about them and keep them cool. This will also help protect them from water damage should the storage facility leak.
- Always remove the cases of explosives from the storage facility to a safe area before opening.
- Never assemble explosive primers within the storage facility.
- Never store safety fuse near oils or solvents. Keep it sealed and dry.
- Never store blasting caps with other explosives unless the tactical situation clearly demands it.
- Never carry loose blasting caps in the pockets.
- Never insert a foreign object into the open end of a blasting cap.
- Never leave explosives or blasting caps exposed to the direct rays of the sun.
- Never use electric blasting caps during the approach or progress of an electrical storm or when blasting radio towers or power pylons.

- Never remove the short-circuiting shunt from an electric cap until you are immediately ready to use it.
- Never divide responsibility for bomb construction—you start it, you finish it.

PREPARATION OF EXPLOSIVE CHARGES

A firing system is composed of those parts which collectively provide for initial ignition, delay, and detonation, such as a match, time fuse, and blasting cap, or a mechanical, chemical, or electrical fuze and blasting cap. The process of assembling the explosive and blasting cap or igniter (if a low explosive is used) is called "priming." Only one primer is required for a large mass of high explosive. Upon detonation of the primer, a shock wave is transmitted to the surrounding explosives, striking them with sufficient shock to cause detonation. In the case of low explosives, the opposite is true.

When priming a high explosive, it is important that the blasting cap be placed centrally within the explosive mass. For example, with plastic explosive, the cap is positioned so that at least half an inch of peripheral mass exists along the sides of the cap, with the closed end about 1 inch inside the mass. Cast explosives and hard-pressed block explosives such as TNT will have a cap well in one of their ends to receive the blasting cap. Military TNT blocks have a threaded cap well for use with small plastic priming adapters.

Twine or tape may be used to secure the blasting cap to the charge. The twine needs to be wrapped tightly around the block and tied securely over the cap well, leaving several inches of twine after the tie is made. The cord is moved to one side and the cap inserted. The free length of twine is used to make a tie around the cap wires.

Plastic explosives and dynamite are primed by punching a hole into the explosive mass or stick, inserting the cap, and securing it in place with twine or tape. The cap must be centrally located within the explosive. After inserting the cap,

the explosive mass should be given a firm squeeze so that the explosive is in intimate contact with the cap. Failure to do so may result in a misfire or low-order detonation.

MORE SAFETY NOTES

The detonation or burning of all explosives produces poisonous fumes in varying amounts, depending on the particular type. Most chemicals used in explosives are poisonous and should be handled as such. Personnel need to be cautioned against inhaling the fumes after an explosion or of ingesting explosives.

This last point may seem a bit silly, but in reality it is not. During the Vietnam War it became somewhat of a fad to chew C-4 plastic explosive to attain a "high." With the widespread availability of all types of conventional drugs in Vietnam (part of the People's Republic of China's chemical warfare assistance to the NVA), I never could understand this practice. Different strokes, I guess.

When explosives are used inside enclosed areas or underground, adequate time should be allowed for the fumes to dissipate before entering. Sometimes it is necessary to wear a dust mask to prevent inhalation of plaster dust from an interior explosion.

Explosives contain their own oxidizer, so burning explosives cannot be extinguished by smothering with water. In fact, any type of smothering will probably cause an explosion. A good case in point occurred in Vietnam during the recent unpleasantness. C-4 plastic explosive was popular with the troops as a cooking fuel. When a small lump of C-4 was lit, it could bring a canteen cup of water to a rapid boil, thus making the cooking chore quicker and easier. On at least one occasion, one of the troops got his fire going and received the order to move out. Being raised on Smoky the Bear principles, he tried to put out the lump of burning C-4 by stomping on it. The C-4 detonated, taking off the better part of his foot. When explosives are burning, there is always the possibility of detonation. Keep your distance.

CHAPTER 3 *INITIATION DELAYS*

PYROTECHNIC DELAYS

Probably the simplest and most basic of delay mechanisms is the use of a slow-burning fuse. First, we will start with a general discussion of the pros and cons of this technique.

PROS:

1. Simple assembly. All parts available from civilian blasting supplies.
2. Simple to use, even by the most unskilled of operatives, with a few minutes of instruction.
3. Very reliable.

CONS:

1. Fuse emits smoke, which may betray presence of bomb. (A sealed container would help retain the smoke from the burning fuse.)
2. Very simple to disarm (by cutting the fuse).
3. Generally only useful for low-security "soft" targets.

The length of the fuse used depends on how long it will take to vacate the scene. Four to five minutes is usually adequate to allow escape as well as prevent the enemy bomb squad from arriving in time to disarm it. In some special cases, the bomber can get away with half that much, but he had better be damn sure that his egress is unimpeded.

The narcoterrorists who have been giving the Colombian people such a bad time lately use this technique almost exclusively, coupled with 10- to 15-kilogram charges

of commercial dynamite. Their rate of duds, misfires, and disarms is extremely low. In fact, I probably wouldn't have mentioned this technique if it weren't for their recent successful use of it.

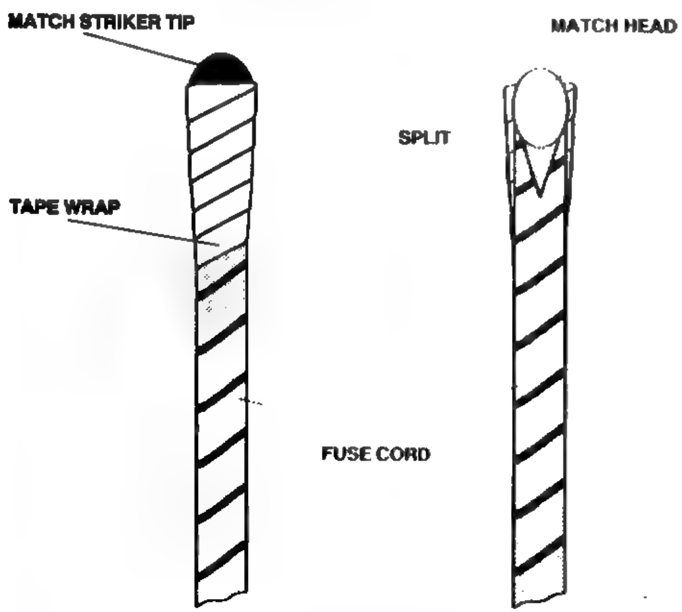
Nonelectric Priming

1. Prepare a cap well in the explosive package, if necessary. If dynamite or plastics are used, punch the cap well with a pencil. It should be as long as the blasting cap.

2. Cut and discard a 6-inch length from the free end of the fuse roll, as it may have absorbed moisture from exposure to the air.

3. Cut off a 1-foot length of the fuse cord to check the burning rate. Light the end and note the time it takes to burn.

4. Cut a length of fuse cord long enough to permit the sapper to reach a safe distance by walking at a normal pace.



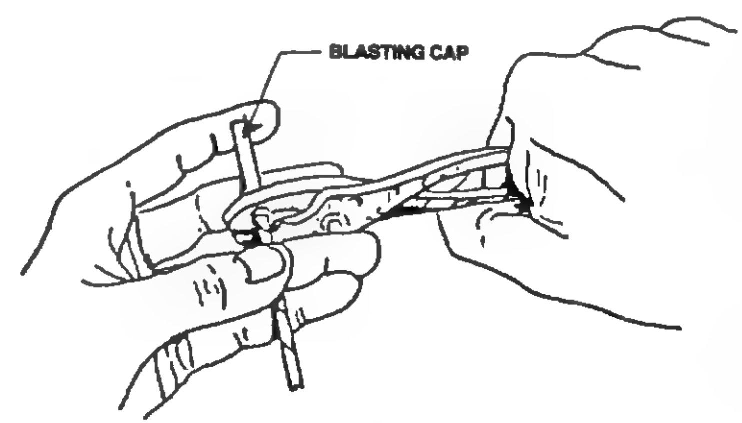
Match Fuse Lighter Assembly

5. Use a sharp knife to split the end of the fuse about 3/4 of an inch down. Try not to let any of the black powder core leak out. Insert the head from a wooden match into the split, with the striking tip pointing up. Wrap the cut tightly with electrical tape until only the tip is exposed.

6. Inspect the blasting cap by looking into the open end. If any foreign matter is present, hold it with the open end down and shake it gently or bump the hand holding it against the other hand.

7. Hold the fuse cord with the freshly cut end up and roll the end between your fingers to make sure it is round. Slip the blasting cap gently down over it so that the flash charge in the cap is in contact with the end of the fuse.

8. After the blasting cap has been seated, grasp the fuse between the thumb and third finger of one hand and extend the forefinger over the end of the cap to hold it firmly against the end of the time fuse. Keep a slight pressure on the closed end of the cap.



Crimping a Nonelectric Blasting Cap

9. Crimp the cap at a point 1/8 to 1/4 inch from the open end. A crimp too near the explosive in the blasting cap may cause detonation. Point the cap out and away from the body during crimping. Cap crimpers are the best tool to

use, but if they are unavailable, regular slip joint pliers are adequate, if used carefully. Wrap a piece of electrical tape around the fuse/cap junction to protect it from moisture.

10. Insert the blasting cap into the prepared cap well and secure it in place with tape or twine.

NOTES:

1. Always use a sharp knife or cap crimpers to cut the fuse, and cut it straight across.

2. Always double prime when possible. Bind the two fuse cords together with short strips of tape every 6 inches or so along their length.

3. If the fuse/cap assembly is to be stored for more than a day or so (not recommended), slip a condom over the free end and tape in place to protect it from moisture in the air. The condom can be easily torn off with the fingernails when necessary.

When ready to use, remove the cover, if any, from the fuse tips. Use a matchbox to strike across both match tips simultaneously. A jet of smoke and a hiss will confirm when the fuses have ignited. Leave the area.

LEAD BREAK FUZE

This type of fuze has been in use since World War II and has proved itself both rugged and reliable. A cocked striker, or firing pin, is restrained by a short length of lead solder wire. Pressure from the striker spring pulls the top of the striker shaft against the solder wire, slowly cutting its way through. When the solder can no longer restrain the load of the spring, it releases the striker to impact the primer and detonate the charge.

Believe it or not, the test model of this little fuze delivered a 4 1/2-hour delay. The length of delay is influenced by three main factors:

1. Spring Power—This is, of course, self-explanatory. If you press harder against something you are cutting, it cuts faster.

2. Solder Type—Solder wire varies widely in diameter

and composition. If the type of wire used is changed, the wire must be retimed. Most types will work, but some will not. The solder wire I used in constructing one of the original test models three years ago still hasn't broken.

3. Temperature—In cold weather, solder wire hardens somewhat and will deliver a longer delay than one operating at room temperature. Conversely, extremely high temperatures will soften the solder somewhat and shorten the delay.

If a shorter delay than the solder wire can deliver is required, the striker shaft can be ground or filed above the solder hole, making it thinner. This reduces the amount of metal bearing against the solder wire, in effect cutting it with a sharper knife.

In my first book, *Anarchist Arsenal*, I covered a version of this fuze made from half-inch copper pipe parts. The one presented here is an advanced version that is smaller, lighter, and cheaper. Experience has also led to modifications and refinements that have improved its performance.

The following parts are required:

- 12-penny duplex nail (striker)
- 5/16" metal tube, 3" long (fuze body)
- #6 washer (shear pin support)
- 1/4 x 1 3/4" spring (Century C-654 or equivalent)
- 1/4 x 1 1/2" steel bolt (primer/detonator assembly)
- Small rifle or pistol primer
- Nonelectric blasting cap (detonator)
- Coat hanger wire (arming and safety pins)
- Solder wire (shear pin)

Modification of Parts

1. Striker—Saw the head off the duplex nail and cut off any excess length. Chuck the nail in a drill, lock the trigger on, and use a file to grind it into shape. Drill two 3/32-inch holes about 1 1/4 inches up the shaft from the tip at 90-degree angles to each other and 1/8 inch apart. File off any burrs. Chuck the nail back in the drill and polish it with a piece of emery paper until it is slick and smooth.

2. Fuze Body—Cut off a 3-inch length of the 5/16-inch

metal tube. The best tool for the job is a small tube cutter. I bought a cheap hobbyist tube cutter, removed the cutting wheel, and purposely dulled it with a file. When this cutter is used, it crimps down the tube a considerable amount before it cuts through. This will make a secure seat for the spring. Drill a 3/32-inch hole through the tube about 1/2 inch from the bottom (uncrimped) end. This will hold the positive safety pin. Remove any burrs from the tube.

3. Primer/Detonator Assembly—Saw the head and all but 1/2 inch of the threads off of the bolt. File both ends flat. Using a 11/64-inch drill bit, drill a hole in the center of the bolt (unthreaded end) just deep enough to seat the primer, no deeper.

Next, drill a 3/32-inch hole in the center of the first hole all the way through the remainder of the bolt. This is not as easy as it sounds, so be sure to have extra bolts and drill bits handy. Chuck the bolt in the drill and use a file to grind down the threaded portion until it will easily slide into the mouth of the blasting cap.

Reverse the bolt in the drill and, using the edge of the file, cut a groove into the side, about 1/4 inch down from the primer end. Seat a primer into the larger hole using a vise padded with a piece of wood. Do this slowly and carefully, and be sure to wear eye protection. Paint around the primer with a sealer, such as nail polish, to waterproof it.

4. Shear Pin Support—Ream the center hole of the washer with an 11/64-inch drill bit.

Assembly

Coat the firing pin and spring with a light coat of oil and slide them into the tube. Use a 1/4-inch rod to compress them until the striker shaft protrudes from the end of the tube. Slide the washer over the shaft and slip a short piece of coat hanger wire (arming pin) through the lower hole. Release pressure on the rod. The striker will be retained in the tube by the arming pin.

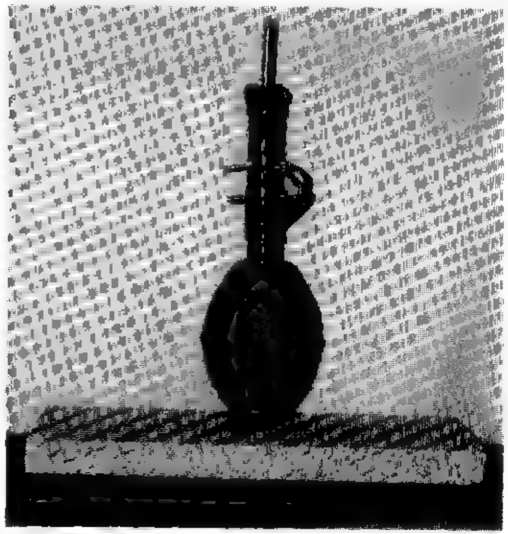
Slip a length of solder wire through the upper hole and

pull its ends down the sides of the fuze body. Secure it in place with a strip of tape.

Slide the primer/detonator assembly into the tube. Estimate where the groove is located and use the dulled tube cutter to crimp it into place. Add a drop of superglue as security.

Cover one of the positive safety pin holes on the fuze body with a short piece of tape. Pierce the center with a straight pin. Push the safety pin through this hole and into place. The grip of the tape will retain it.

Pour a small amount of flash-sensitive powder into the blasting cap and crimp or tape it into place. The fuze is now complete.



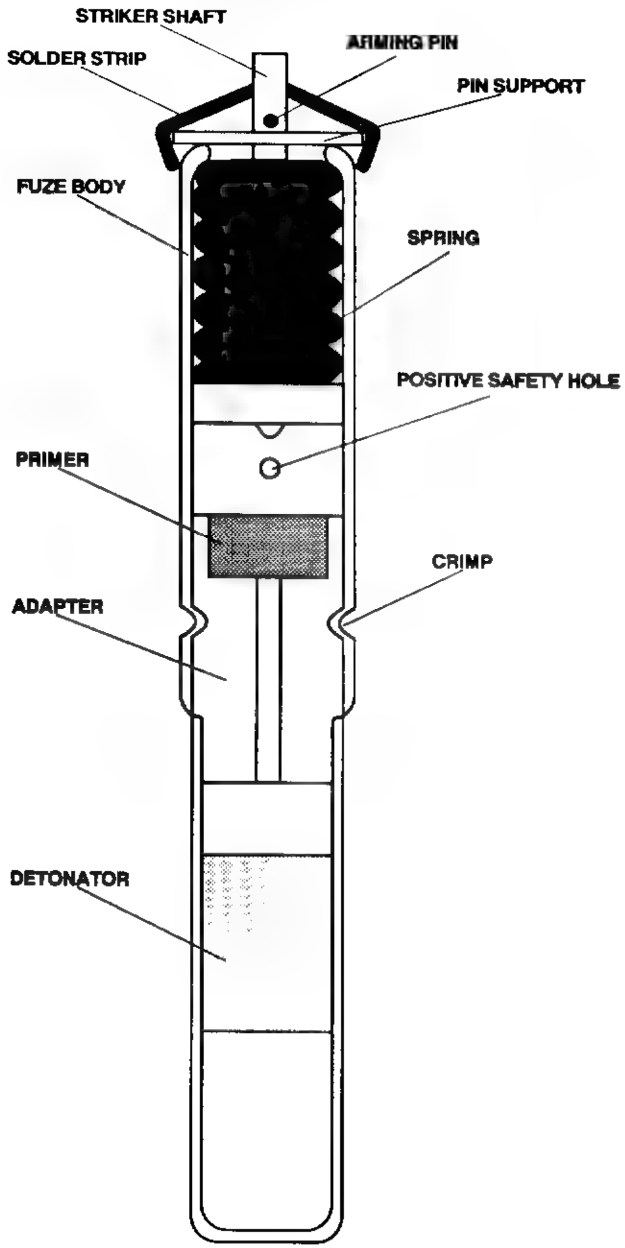
Original test model of a lead break delay, mounted on a U.S. M-26 hand grenade.

Operating Instructions

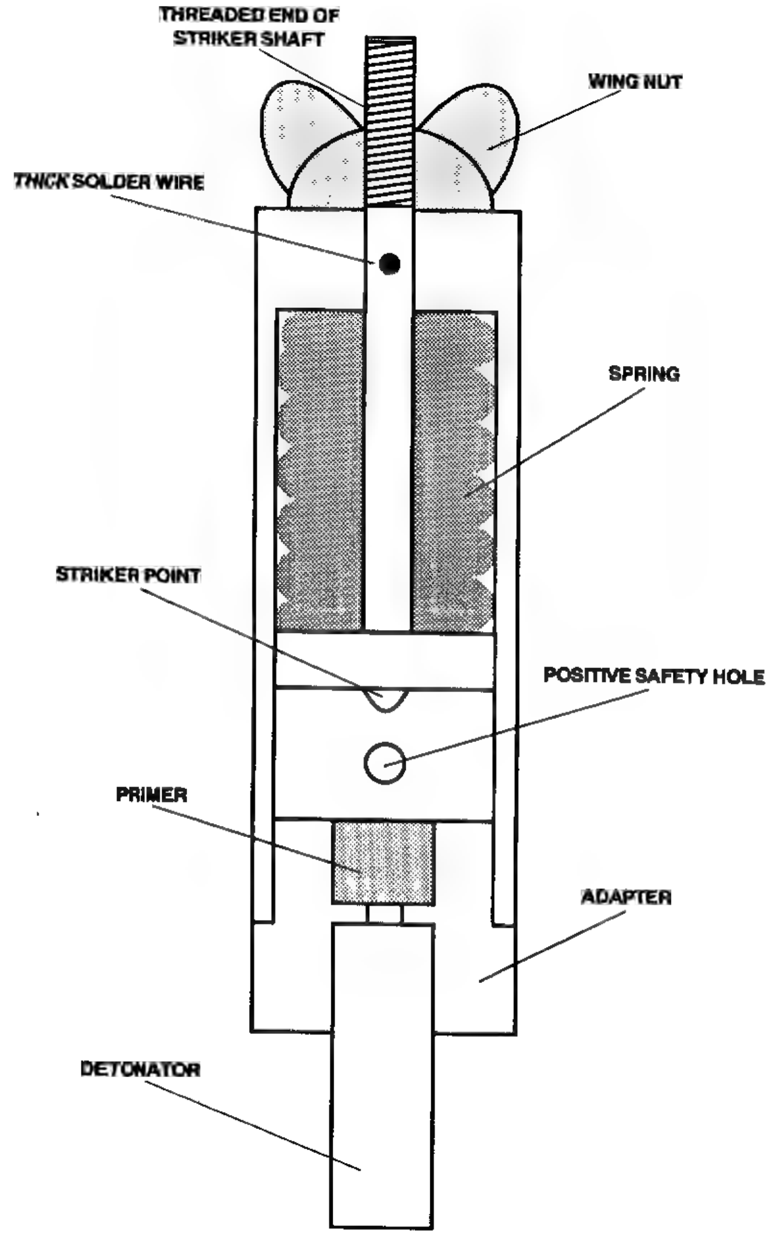
1. Insert the fuze into the explosive charge.

2. Withdraw the arming pin. The striker shaft will snap down onto the solder wire and slowly begin its descent. If for any reason the solder wire fails, then the striker will be caught by the positive safety pin.

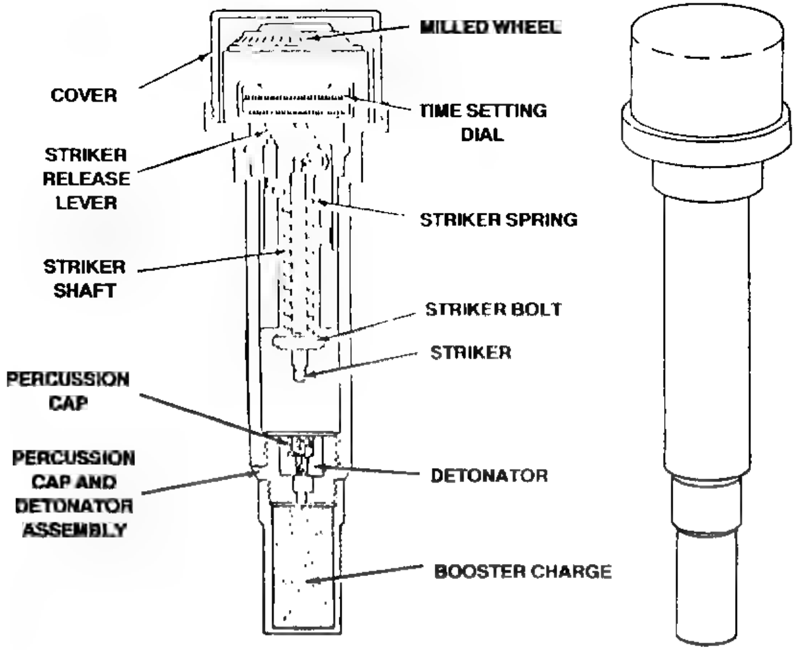
3. If the solder holds, withdraw the safety pin. The fuze is now fully armed.



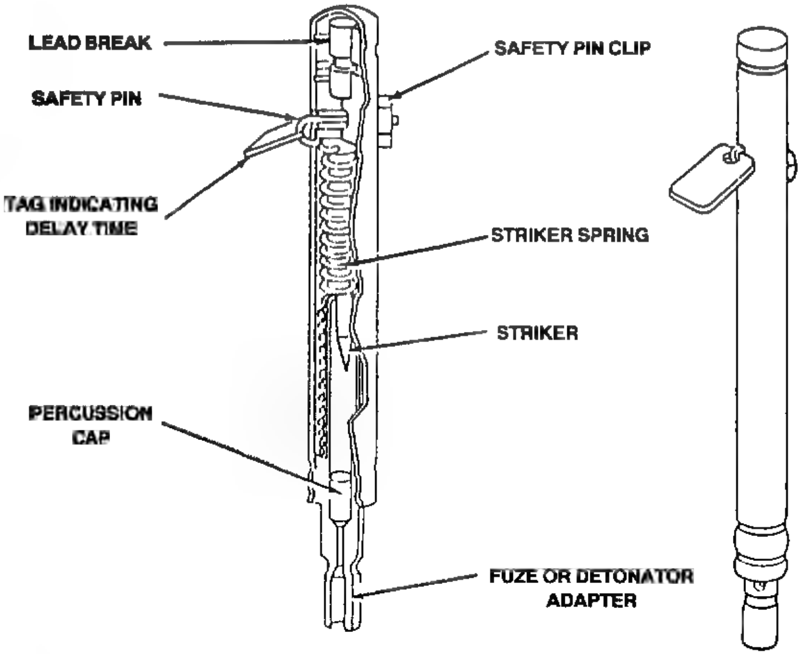
Lead Break Fuze



Alternate-Type Lead Break Fuze



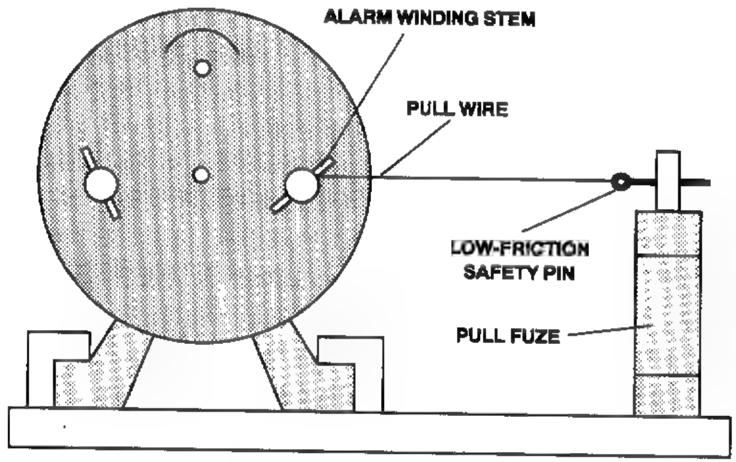
Finnish Clockwork Delay Fuze (mechanical-straight)



British Lead Break Fuze, No. 9 (mechanical-straight)

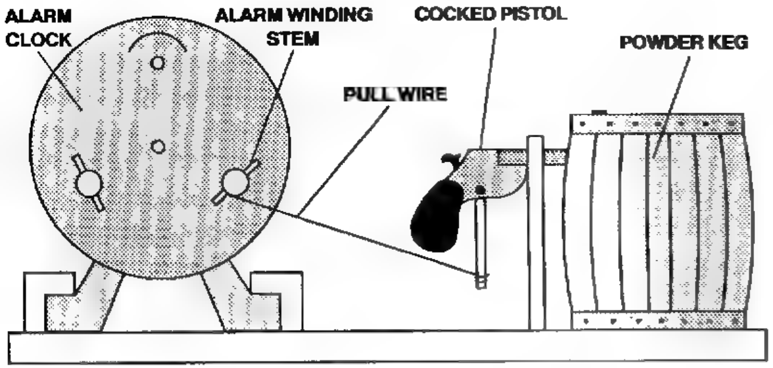
CLOCKWORK ELECTRICAL DELAY

The use of mechanical (analog) clocks and wristwatches is an effective and time-honored timer technique that is well over 100 years old. The earliest reference to this method I could find was in an 1882 patent, and even then it was referred to as a "well known" technique. Whenever or wherever it originated, it is an effective and reliable system that has seen worldwide use. It was a standard tool for saboteurs in both world wars and has long been a favorite of professionals and crazies alike.



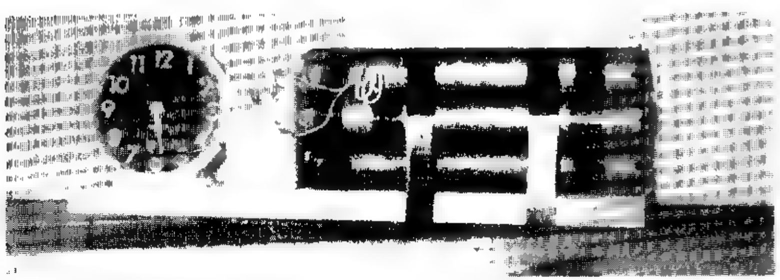
Alarm Clock/Mechanical Delay

This variant is built along the lines of the early infernal machine mechanisms. It uses the power of the winding stem spring to remove the safety pin from a simple pull fuze. The detonator affixed to the fuze is run through the baseboard into the explosive charge. The safety pin should be relatively easy to withdraw, while still allowing the striker sufficient power to fire the primer cap. Use of a pistol primer, which requires less impact force to fire, is recommended. A Teflon-coated nail works as well as the safety pin, combined with a little grease to reduce friction. The pull wire should be arranged so that it pulls the pin straight out. This requires less force. As with all alarm clock delays, the clock should be muffled with a thick layer of fiberglass insulation, taking care that it doesn't interfere with the operation of the device.



Clockwork-Mechanical Fuze
(as used in some of the early infernal machines)

On this type of infernal machine, the alarm winding stem is attached to the trigger of a small pocket pistol, which is extended to provide better leverage. When the alarm goes off, the pull wire discharges the pistol into the keg of powder. At least one variant used two pistols for reliability. The "Boule de Verdun," an antibridge mine built during the Franco-Prussian War, used a clockwork mechanism connected to a double-barreled pistol for its ignition system.



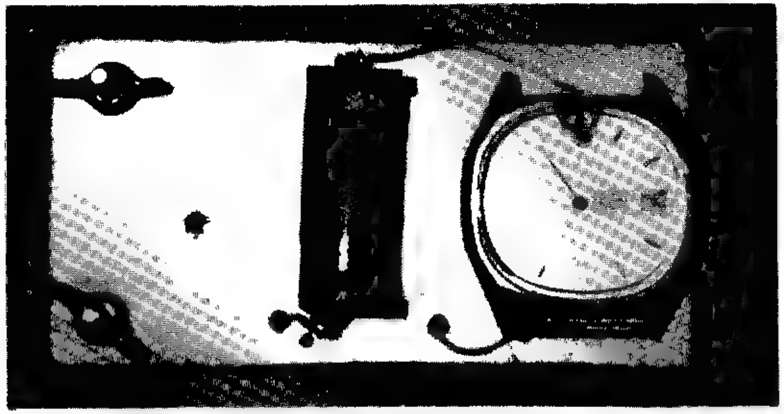
Alarm clock timer with seven sticks of dynamite. The safety switch and binding posts for the detonator are mounted on a board to the right of the clock. The entire assembly is mounted securely on a wooden base.

This fuze will be covered in both wristwatch and alarm clock variants. Both operate on the same principle, for the most part, but with slightly different construction tech-

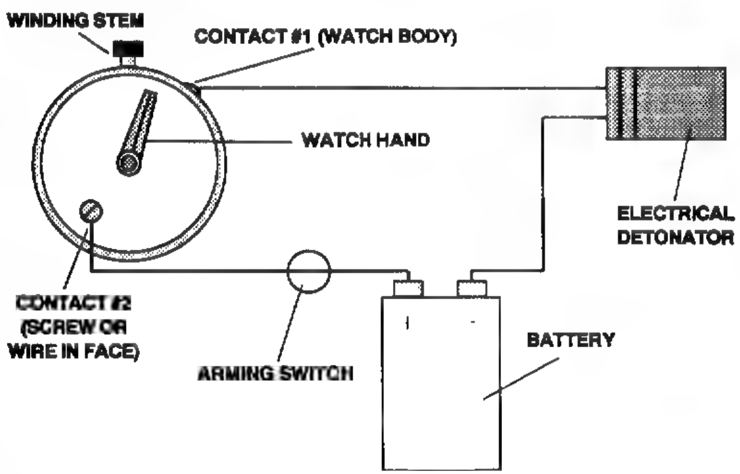
niques. The basic model uses the rotating hands of the clock to complete an electrical circuit and fire the bomb.

NOTE: The basic method may be adapted for use with a stopwatch if *really* short delays (55 seconds or less) are required.

1. Remove the plastic "crystal" (dial cover) from the clock face.
2. If a delay of less than one hour is required, remove the smaller hour hand. If more than one hour is required, remove the larger minute hand. Remove and discard the sweep second hand, if present.
3. Scrape the finish off the leading edge of the hand where it touches contact #2. This will ensure a good connection.
4. Drill a hole through the crystal just big enough to receive the contact (#2). A small screw should be employed as the contact, but if a wristwatch is used, it is best to use the bent end of the connecting wire as the contact. Tape or glue the contact in place. (NOTE: A blob of model airplane cement works well. Avoid using one of the cyanoacrylic "superglues," as the capillary action of this type of adhesive has a tendency to coat the contact, effectively insulating it.)
5. Replace the crystal on the clock face. Check to ensure that the hand will touch the contact.
6. Attach the other contact wire to the case of the clock. For alarm-type clocks, there is usually an external screw used for disassembly. This screws straight into the chassis of the mechanism and is perfect. For a wristwatch, the wire should be attached to the case with a drop of solder. Some recommend wrapping the wire around the winding stem, but this tends to interfere with the winding of the watch if it is properly secured.
7. Assemble the rest of the circuit as shown in the drawing. *Make sure* that the arming switch is in the OFF position. It is wise to use a light bulb in lieu of the detonator until the circuit is proven to be safe. It may then be replaced by the detonator.



Wristwatch delay mounted on cardboard with N-cell power source, safety switch, and binding posts for detonator wires.



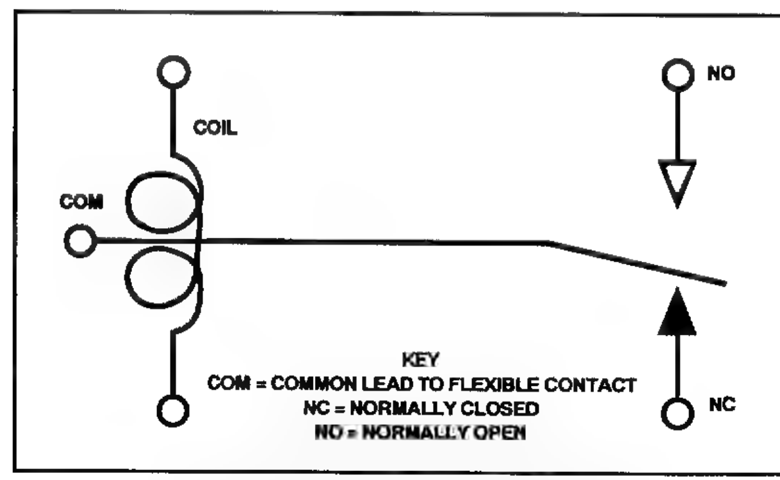
Basic Analog Electrical Delay Circuit
To operate, set the clock hands to the required delay, wind the mechanism, and flip the arming switch to the "on" position.

COLLAPSING CIRCUIT

A collapsing circuit is a simple, cheap, and reliable delay

that has seen long service with many different terrorist groups and which can be built by even an electronic imbecile (such as myself). This device uses an electric relay as the heart of its firing mechanism. A relay is basically an electromagnetic switch. Current from a battery flows through its coil and generates a magnetic field, which moves a flexible contact toward or away from a fixed contact.

The two fixed contacts are known as "Normally Open" (NO) or "Normally Closed" (NC). When the relay is not energized, the moveable contact is positioned by spring tension against the NC contact. When the relay is energized, the moveable contact is drawn against the NO contact. One wire in the firing circuit is attached to the NC contact lead; the other is attached to the moveable contact lead (consult the circuit drawing). When the relay is energized, the NC contacts are open and the firing circuit is incomplete. When the battery power degrades to the point where the magnetic coil can no longer hold the moveable contact against spring pressure, it touches the NC contact, completes the circuit, and fires the initiator.



Schematic Diagram of Relay Contacts
A diagram such as this is usually provided on the back of the relay package, along with the voltage and resistance ratings. Most DC relays have their contacts arranged in this manner.

The amount of time required for this action to take place depends chiefly on the ohmic resistance of the relay coil and the type of battery used. Certain batteries, such as those used in camera photoflashes and cigarette lighters, have high voltage but can only sustain their level of power for a comparatively short length of time. Therefore, if one of these is used, the delay will be shorter. The more ohms a relay is rated for, the longer the delay will be.

Regular transistor radio or flashlight batteries of the same voltage rating will hold the contacts open for a much longer period of time than the aforementioned types, and alkaline batteries will hold them longer still. So, the combination of parts is dependent on the length of delay required. For a longer delay, use a relay with a high ohmic resistance and a battery made to deliver its rated voltage for long periods. For shorter delays, a relay with a low ohmic resistance and a battery of short current delivery is required.

With the proper combination, delays can be achieved ranging from about 15 minutes to several months. Its only drawback is that its accuracy is ballpark at best. Depending on temperature, battery condition, and other variables, the delay can swing as much as 25 percent or more either way. Use an electronic timer if split-second accuracy is required.

Parts for a collapsing circuit include:

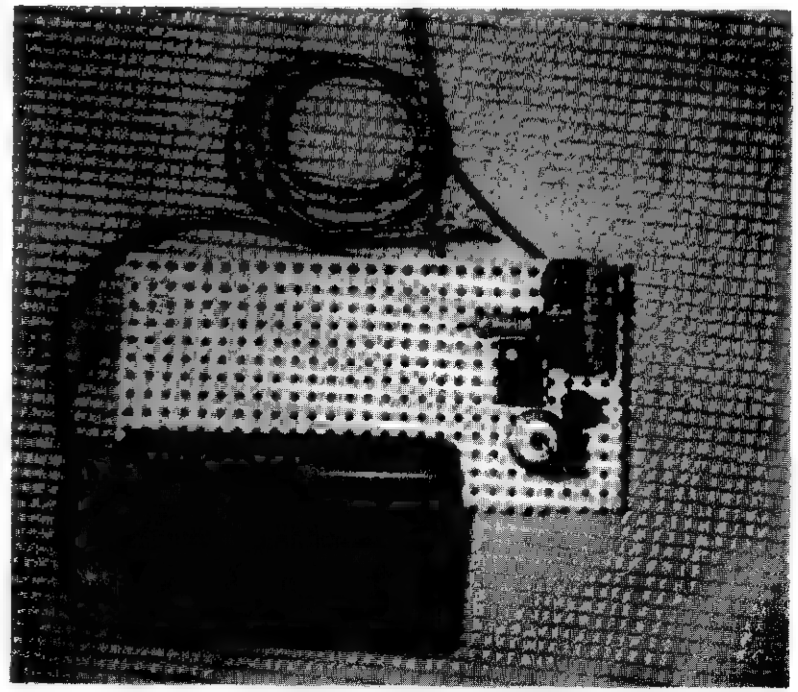
- 1 DC relay
- 1 relay battery
- 2 toggle or other SPST switches
- 1 firing battery
- 1 electric initiator

What follows are the results of some informal testing I did of this circuit to determine the length of delay that could be expected from various types of batteries.

500-OHM, 9-VOLT RELAY	AVERAGE DELAY
9-volt standard battery	23 hours
12-volt alkaline cigarette lighter battery (N cell)	3 hours, 15 minutes
6-volt Polaroid "Polapulse" battery from SX70 film cartridge *	17 hours (!!!)

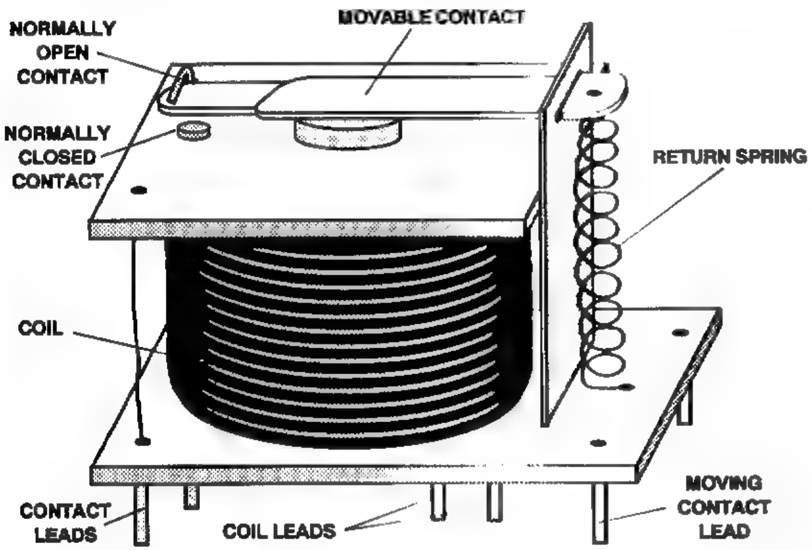
* I used this battery mainly because I thought I could get a very short delay with it, as opposed to the others used in this test. It had already been used to fire a full cartridge of film and really shouldn't have been capable of this level of performance. Apparently, the Polaroid company wants to make absolutely sure that its batteries will retain enough voltage to do the job. This speaks well of their products.

The voltage a relay is rated for can usually be exceeded by up to 50 percent in most cases without burning the coil out. For instance, a 6-volt relay can use up to 9 volts safely. This will usually give a longer delay, but this is dependent on the type of battery used. Conversely, if shorter delays are required, the relay can sometimes be run at a lower voltage. Testing is required to find out exactly how low it can go (the limbo principle).



Short-delay electronic timer, with battery installed (see page 87).

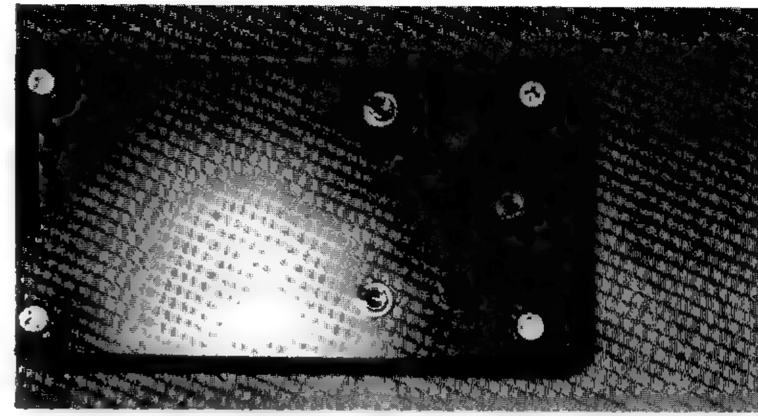
Another method of producing shorter delays is to insert a resistor into one of the power leads of the relay. Once again, some testing will be needed to determine the approximate length of the delay, but in one test I performed, inserting a 10-ohm resistor into the circuit with the 12-volt lighter battery previously mentioned, the delay was shortened from 3 hours and 15 minutes to an average of 40 minutes. It is best to start with the lowest resistor available and work up in increments until the desired delay is achieved.



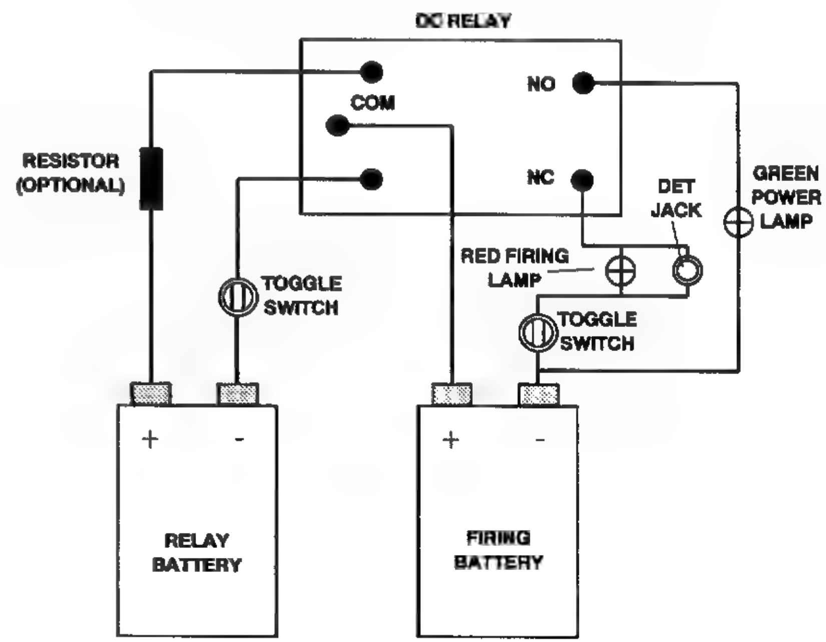
Typical SPDT Relay Interior

Collapsing Circuit Addendum

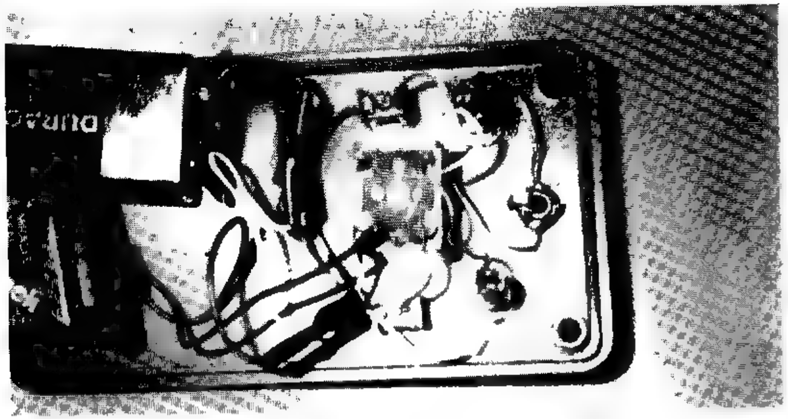
The example illustrated is one I call the "Cadillac" model. It is the safest circuit of this type, but all the lights and switches do run into a bit of money. If the operative is strapped for cash or has a limited selection of parts to work with, there is a much simpler version, which I call the "Yugo" model. The only parts needed are the relay, batteries, battery holders, wire, tape, and a piece of cardboard to mount them on.



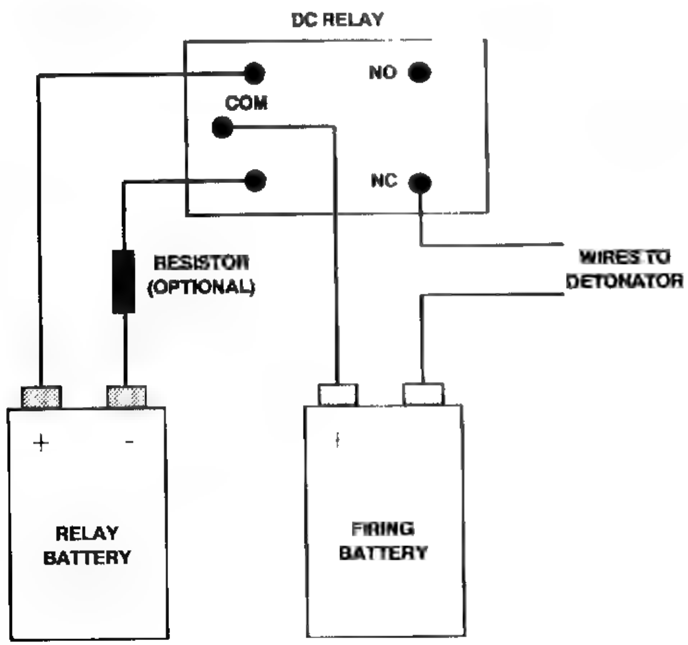
External view of Cadillac collapsing circuit delay showing toggle switches, lamps, and detonator jack.



Collapsing Circuit Drawing (Cadillac version)



Internal view of Cadillac collapsing circuit delay.



Collapsing Circuit Drawing (Yugo version)

The relay makes an audible "click" when it changes position, so theoretically, one can do without the green relay lamp. Though it can be built without them, the battery holders should be kept, as they will function as on-off switches in the absence of anything else. The red lamp and det jack are replaced by two bare wires. The detonator leg wires are twisted onto the two firing wires after the relay is energized. A small light bulb is handy to ensure that there is no power running through the firing wires before the detonator is attached. If the bulb is not lit, the arming can be completed safely. This variant is simple and easy to build, but the same care must be used in its construction. Frankly, I consider my own sweet ass to be worth more than the extra $10 that the lamps and switches will run. Others may feel differently.

The Cadillac operating instructions are as follows:

1. Flip switch A (relay) to ON position. The green lamp should come on with a constant, nonflickering light.

2. Flip switch B (firing) to ON position. The red lamp *should not* light.

3. Flip switch A to OFF position. The red lamp should now light.

4. Flip switch A back to ON position. The green lamp should light and the red lamp should go out. This shows that the circuit is safe.

5. If the red lamp is out, the detonator may be plugged in safely. The bomb is now armed. NOTE: If desired, the det jack may be replaced with two single strand wires, which are twisted around the leg wires of the detonator in standard fashion (Western Union pigtail splice).

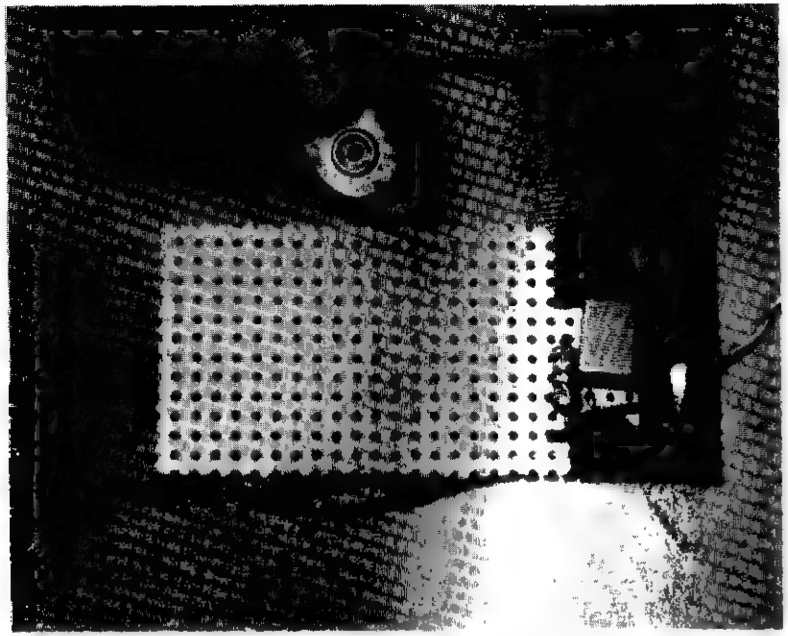
The Yugo operating instructions are as follows:

1. Snap relay battery into its holder. The relay should click.

2. Snap firing battery into its holder.

3. Clip test-bulb wires to firing wires. If it does not light, disconnect relay battery. At this point it should light.

4. Reconnect the relay battery. The bulb should go out. If this occurs, unclip the bulb wires and connect the detonator leg wires. The bomb is now armed.



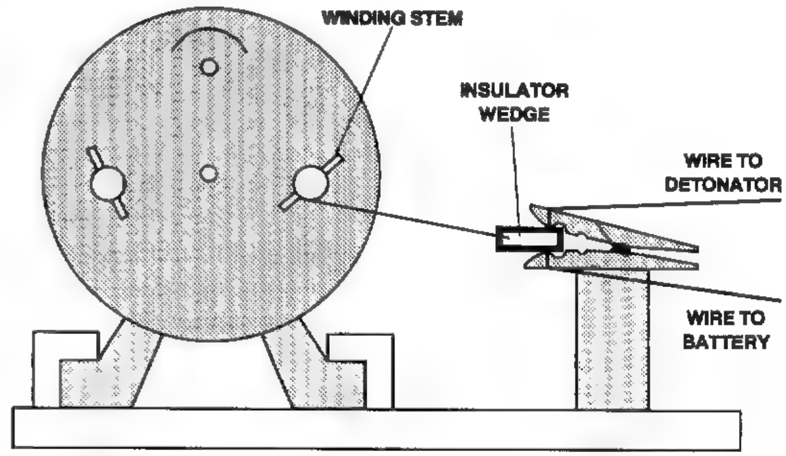
Yugo collapsing circuit delay with batteries removed, showing relay and optional resistor.

CLOTHESPIN/SOLDER DELAY

This is probably the simplest bomb of its type. A favored Provo (IRA) device since the early 1970s, it has fallen into disuse with the more sophisticated of their ASUs (Active Service Units), as it is so easy to disarm. They now tend to go with complex electronic circuits that are *extremely* difficult to render safe.

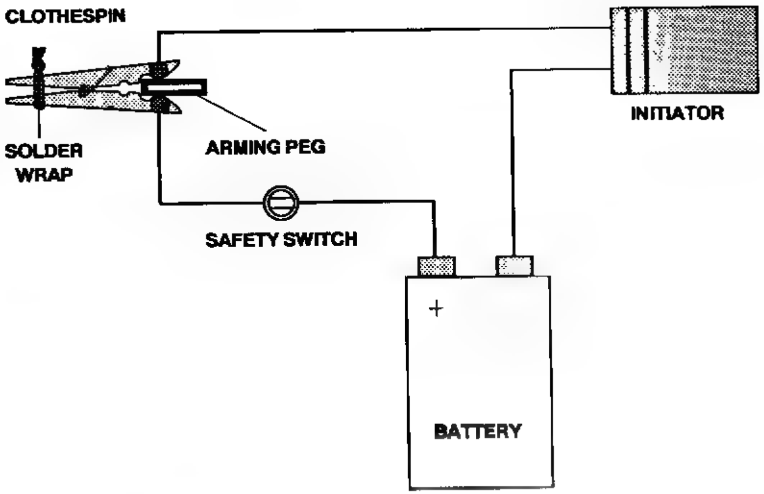
For a time, the IRA used this type of bomb as an "initiation" device to test the mettle of young hopefuls looking to join the ranks. On more than one occasion, in their fright and haste to get rid of the nasty thing, the novice bombers would forget to arm it. It then became policy to require the return of the arming peg to the issuing authority as proof of performance. At least one of the pegs was recovered with a tag attached which bore the address it was to be returned to. This delighted the security forces to no end.

The timing device is simplicity in itself. A common wooden clothespin switch is wrapped with a turn or two of solder wire. When spring tension from the clothespin stretches the wire enough, the contacts on the jaws close, completing the circuit and firing the bomb. The length of delay is governed by the thickness of the solder, the number of wraps used, and the tightness of the wraps. Uniformity of delay can only be achieved by uniformity of construction. Testing is required to determine the approximate length of delay. If a semiproduction line is set up, the IRA practice of writing the estimated length of delay on the clothespin for easy reference may be employed. Just don't put your address on the arming peg, okay?

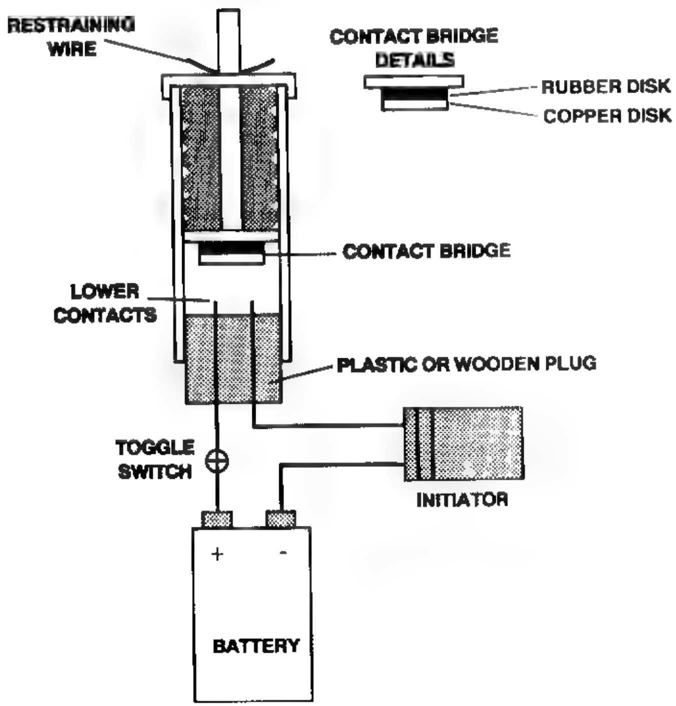


Alarm Clock/Clothespin Delay

Another simple variation of the alarm clock winding stem approach is to use the line attached to the winding stem to pull the insulator wedge from a simple clothespin switch. The switch is modified by gluing two plastic strips on the side to prevent the wedge from accidentally dislodging and with the addition of a plastic safety pin that is to be withdrawn upon arming. As before, the base of the clock must be fastened securely to the baseboard.

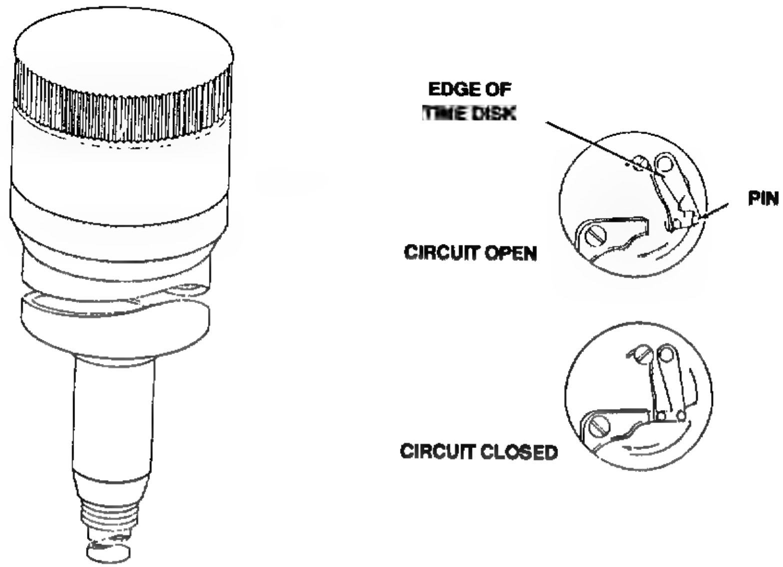


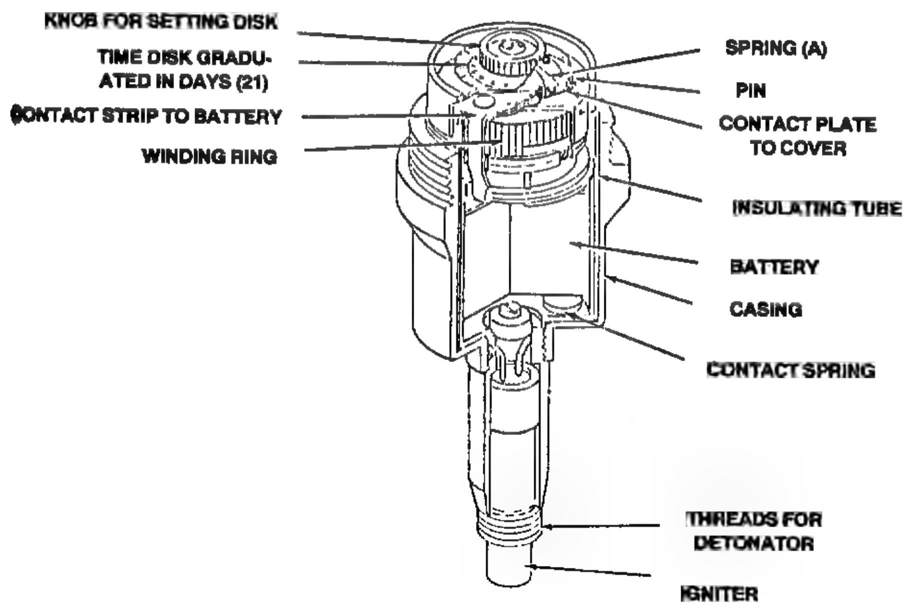
Clothespin Delay Circuit



Lead Break (Electrical)

The rubber and copper disks are cut out of sheet with a paper punch and glued together. The use of an insulated bridge is not mandatory but will reduce the chances of an accidental circuit closing.





German Clockwork Long Delay Fuze
(mechanical-electrical)

STRAIGHT CHEMICAL DELAY FUZE

This type of delay uses a corrosive liquid which eats its way through a barrier material and comes into contact with a reactive substance, producing the heat and flame needed for initiation. The most commonly used corrosive is concentrated sulfuric acid, which is readily available. The most commonly used reactive is a chlorate-based composition, such as potassium chlorate and sugar or match heads. The materials that have been used as barriers are many and varied. In the past, materials such as paper, cardboard, copper sheet, rubber sheet (balloons, condoms, etc.), gelatin capsules, and even ping pong balls have been pressed into service.

This example uses a gelatin capsule barrier, but in an unconventional manner—glued to the end of a tube of sulfuric acid. It has the unfortunate shortcoming common to most all chemical timers—temperature variation. For example, in one test series of this device, a one-hour delay was noted at 77°F. When the temperature was lowered to 50°F, a delay of 24 hours was obtained. The delay becomes less and less accurate as the temperature drops, and at 32°F it becomes inoperative. On the plus side, it is very reliable within its temperature range and costs less than a quarter to make. The accuracy may not be exactly pinpoint, but when you consider the increased number of devices the operative can make and use, it all evens out. I have found it especially good when used with cheap incendiary bombs.

Materials needed are:

- Glass tubing
- Gelatin capsules
- Epoxy
- Small birthday candles
- Sulfuric acid
- Reactive powder

Construction

1. Cut off a 3-inch length of the glass tubing. The easiest way to do this if you don't have the special tube cutter is to carefully scratch a line around the circumference of the tube

with the edge of a three-cornered file. As you work your way around, the groove gets deeper and deeper. When the glass gets thin enough, it will snap apart easily.

2. Rotate the ends of the tube in a lamp flame to smooth out any burrs.

3. Heat the end of the birthday candle and shove it into the end of the tube to a depth of about 3/8 inch. Cut off the excess.

4. Place the tube upright in a stand and, using an eyedropper, carefully fill it about 3/4 full with concentrated sulfuric acid. Wipe off the area around the neck.

5. Paint the area around the side of the neck with a thin layer of epoxy and quickly slide the capsule half over the end. After the adhesive dries, dab additional epoxy on any seams that look weak. Let dry.

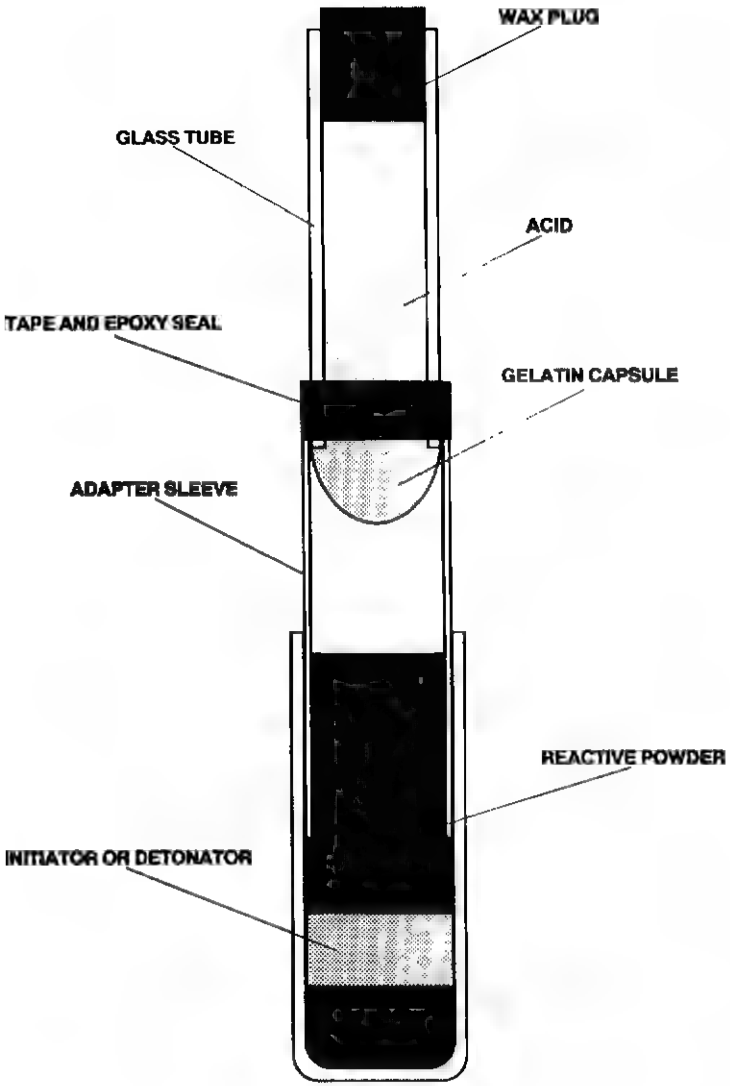
6. Wrap a piece of electrical tape around the seam as insurance. Store the completed fuze in an upright position to prevent activation. To be on the safe side, the fuzes should be made up as needed. They may be carried in a modified "hard pack" fitted with a Styrofoam insert to hold the igniter with the gelatin ends in the upright position.

To use, place the incendiary or explosive device with the initiator/detonator well on top. Remove the plug from the well and insert the fuze, gelatin end first. The bomb is now armed. When the acid penetrates the gelatin, it contacts the reactive powder and sets off the device.

WARNING: As the acid erodes the gelatin membrane, it becomes thinner and thinner, and so the fuze becomes more and more sensitive to shock. Once armed, this fuze must not be disturbed under threat of instantaneous initiation.

NOTES: Different types of gelatin capsules may give varying delay times. Always test before operational use.

For more reliable functioning, wipe the nose of the capsule with a damp cloth. This will make it tacky. Dust the area with reactive powder and let dry in an upright position. Be aware that this will probably shorten the delay.



Glass Tube Chemical Delay Fuze

STRAIGHT CHEMICAL FUZE, TYPE II

This fuze works on the same principle as the previous one. In this example, the sulfuric acid is contained in a

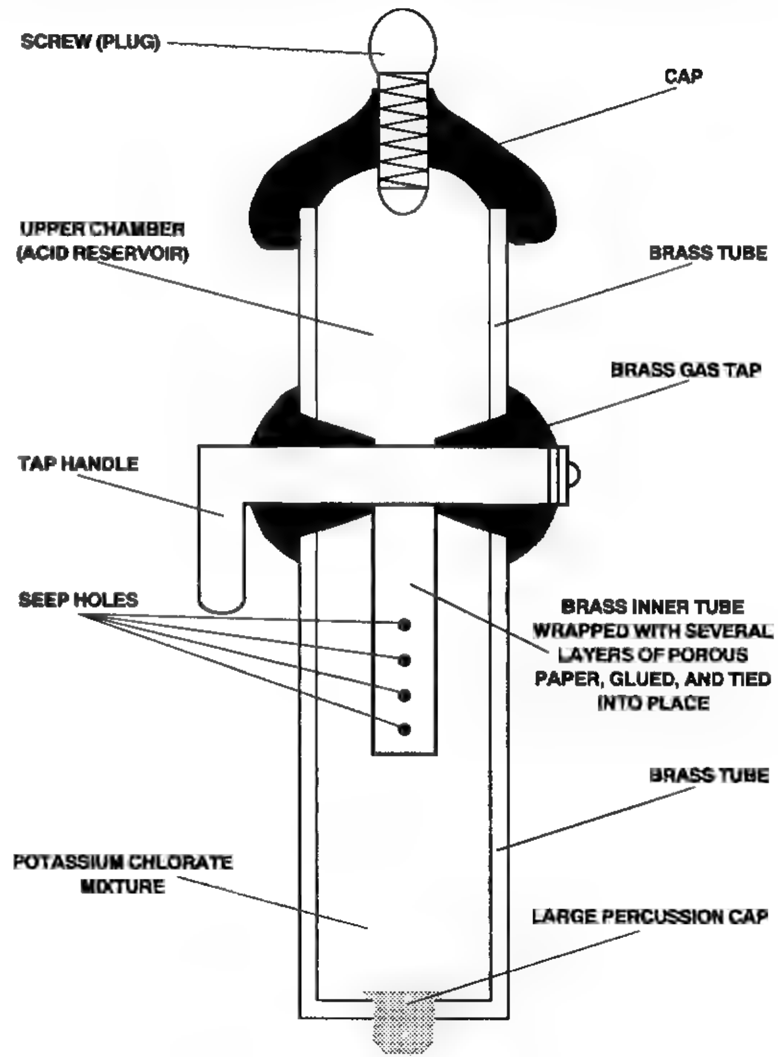
small glass vial. It is activated by crushing the upper portion of the tube, which breaks the vial and allows the acid to come into contact with the thin rubber membrane and eat its way through to the reactive material. The small glass vials may be hand blown, purchased at "head" shops, or modified from a small cylindrical light bulb. If the vial is purchased, its accompanying stopper will need to be coated with wax to protect it from the acid. The size of crush tubing depends on the dimensions of the acid vial.

Parts needed include:

1. Crush Tube—Soft aluminum or copper tube with an inside diameter equal to the outside diameter of the acid vial, and about 3/4 inch longer than the vial.
2. Rubber Membrane—The best material to use is the end portion of one of the long, thin balloons used to make balloon animals.
3. Support Tube—Hard metal tube with an outside diameter the same as the inside diameter of the crush tube.
4. Adapter Sleeve—May be needed if commercial blasting cap is used.
5. Acid Vial—See above.
6. Reactive Material—Match heads or chlorate powder.

Construction

1. Cut the crush tube to the appropriate length.
2. Cut about 1 inch off the closed end of the balloon and slip it over the end of the crush tube. Make sure it fits snugly. Secure with a strip of tape.
3. Slide the acid vial into the crush tube and secure it in place near the top with a drop of epoxy. When dry, plug the top of the tube with a blob of epoxy putty or auto body filler.
4. Prepare the adapter tube from a larger piece of metal or plastic tube. It needs to be about 2 inches long and have an inside diameter that will snugly (not tightly) accept the crush tube with the rubber membrane in place.
5. Slide the crush tube, rubber end first, into the adapter tube to a depth of about 1 inch. Wrap a piece of tape around the tube to secure it in place.



O'Donovan Rossa's Chemical Fuze

CHEMICAL/MECHANICAL DELAY

This fuze is based on the same principle used in most military "time pencils." A striker or firing pin is restrained by a thin wire or line. This wire is wrapped at one point by a pad of absorbent material. A corrosive chemical is soaked into the pad and begins attacking the wire. After a period of time, the wire is unable to restrain the load of the striker spring, breaks, and the striker impacts the primer. The primer in turn ignites the detonator, which detonates the charge.

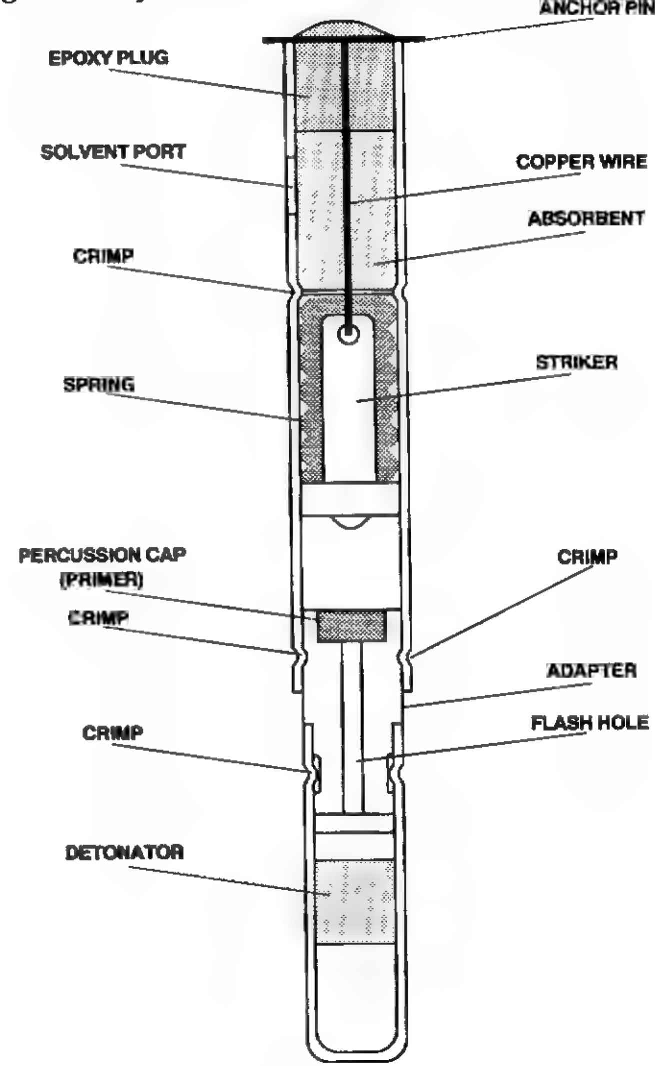
The corrosive chemical is usually contained within a small glass vial, which the user crushes to activate the fuze. While this makes for handy operation, it poses problems for the improviser. First, it requires the machining of a two-part tube—one end of a hard metal to support the spring/firing mechanism, and one of a soft metal, which may be crushed by the fingers and which must be well sealed to prevent leakage. Second, the corrosive must be sealed into small, fragile glass vials that must fit into the narrow tube, a glass-blowing job that is not for amateurs.

The basic design may be modified for use with different solvent or corrosive and wire combinations. The solvent can be carried in a small plastic squeeze bottle such as is used with nasal spray. The fuze is activated by squirting the solvent through the arming port onto the absorbent pad.

The illustrated example was built from 5/16-inch stainless steel tube, but many different types of tube or pipe (metal, plastic, etc.) may be used. The only alterations in the basic design will be due to the dimensional differences in the tubing used.

This version of the fuze uses a liquid solution of ferric chloride to corrode a copper restraining wire. This solution is readily available from electronics parts suppliers, where it is used to etch copper circuit boards. It is quite cheap, about $15 a gallon. The solution is soaked into the absorbent pad and begins eating its way through the restraining wire. The length of time required for breakage to occur depends on the temperature, strength of the solution, and thickness of the wire.

As purchased, the ferric chloride is a saturated solution. This means that the water contains as much ferric chloride as it can hold. Adding water will weaken the solution and so extend the time delay. As always, test to determine the length of delay.



Chemical/Mechanical Fuze, Type I

Parts

1. Firing Pin—The firing pin is made from a 12-penny duplex nail. The head and excess shaft length are cut off and the nail chucked in a drill. A file is used to grind the nail head down to the desired size and shape. (This is sort of a poor man's lathe.) The firing pin and spring fit together closely, eliminating the need for supporting spacers to keep it centered with the primer.

2. Absorbent Pad—The absorbent pad is a small wad of packed cotton.

3. Tube—The end of the tube is sealed with a plug of epoxy or auto body filler. On top of this filler is a short steel pin which serves as an anchor for the restraining wire. The wire is tied tightly to this pin before the epoxy is pressed into place.

4. Adapter—The primer/detonator adapter is identical to the one used on the lead break fuze.

5. Fuze Body—The fuze body is cut from a length of 5/16-inch tube, about 3 inches long. The dull cutter is used to crimp the tube about 3/4 inch down from the top. The arming port is a 1/8-inch hole drilled in the side just above the crimp.

Assembly

1. Attach one end of the copper wire to the firing pin. Give it a couple of twists and add a drop of solder to keep it from untwisting.

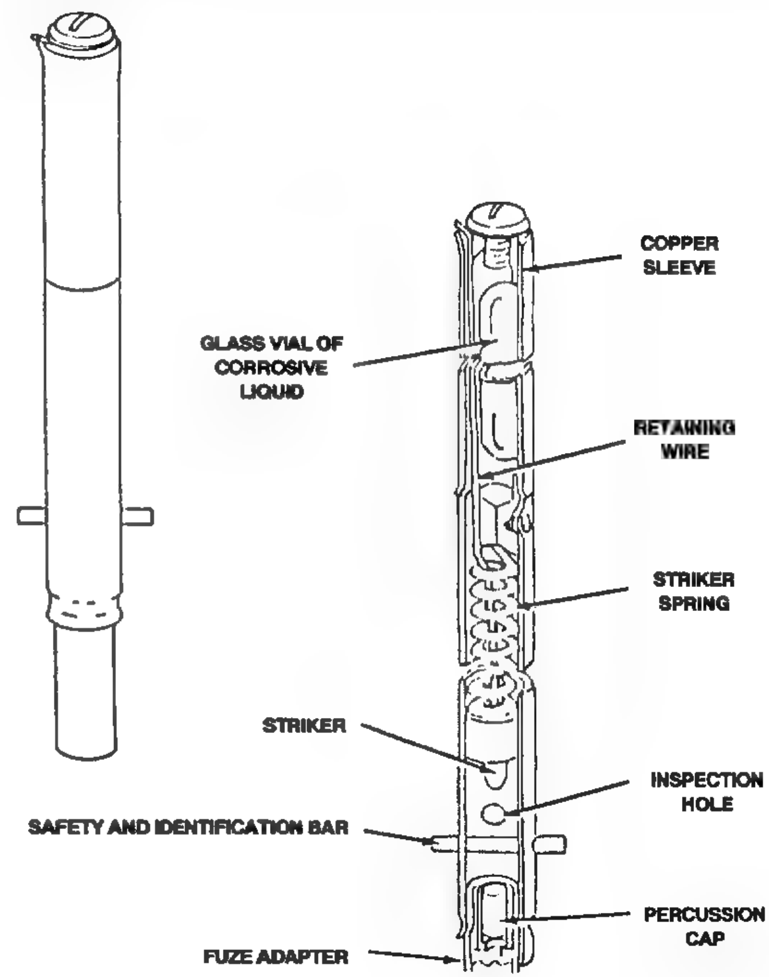
2. Slide the spring over the firing pin and wire. Give it a light coat of oil and slide the hole assembly into the fuze body.

3. Pull the wire through the other end. Pack the area above the crimp with cotton until it is about 1/4 inch from the top.

4. Pull the wire up tight, compressing the spring. Wrap it around the anchor pin and cut off any excess. If there is excessive slack, it can usually be tightened further by rotating the pin a couple of times. Let the pin rest on the top of the tube.

5. Fill the open space above the cotton with epoxy or auto body filler.

6. Assemble the primer/detonator adapter and install in the tube as in the lead break fuze.

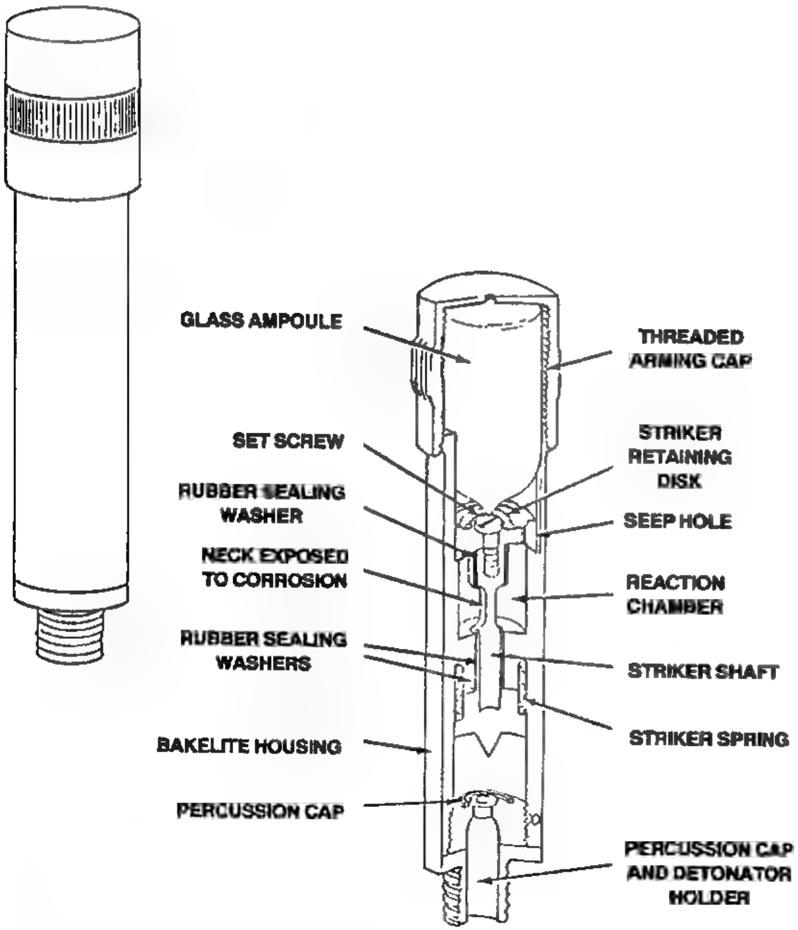


British Chemical Delay Pencil No. 10, Mark I (chemical-mechanical)

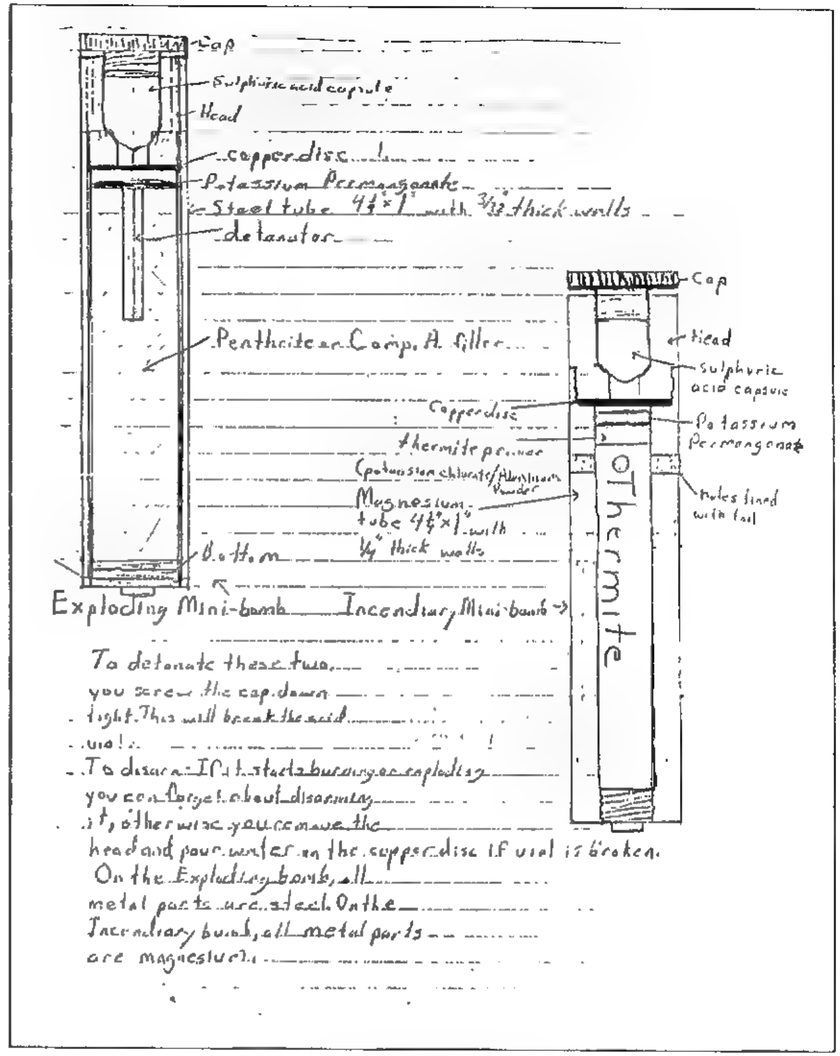
Operation

1. Place the detonator into the explosive charge.
2. Squirt the solvent through the arming port to soak the cotton. The fuze is now armed.

The solvent will eat its way through the wire until it can no longer restrain the striker. The wire will then break and the striker will travel down the tube, impacting the primer and igniting the detonator.



German Type 41 Chemical-Mechanical Delay Fuze



Blast from the Past

Two chemically fuzed bombs designed by author at age 14. Yes, they will work.

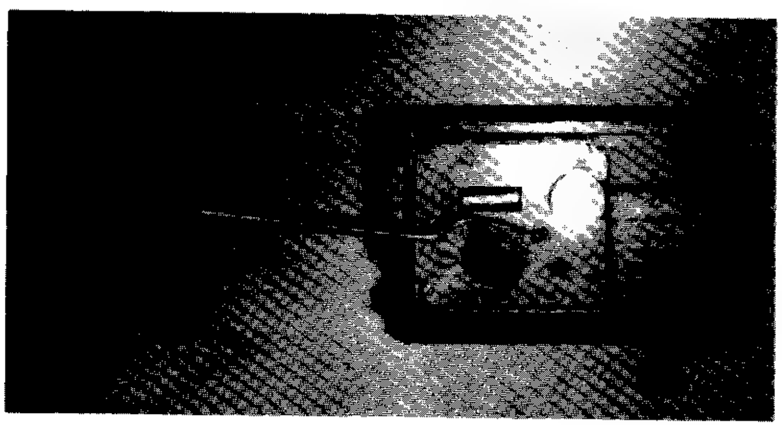
SCR MODIFIED ELECTRONIC CLOCKS

There are many commercial time pieces on the market

today that may be modified for use as electronic time-delay fuzes. Travel alarms, countdown timers, and digital alarm watches are the three main types encountered. All are adapted using the same basic mechanism—an SCR switching circuit, although the construction details will vary slightly due to the differences in the physical form of the time piece.

The SCR (Silicon Controlled Rectifier) is an electronic switch that may be closed by the tiny electric pulse generated by the alarm buzzer of the time piece. An SCR has three prongs—power in (from the battery), power-out (to the detonator), and gate (to the alarm buzzer). Refer to the drawing for details.

When the time piece emits its pulse to the SCR's gate prong (A-1), it closes the circuit, routing the power from the positive side of the battery to the detonator. The circuit drawing contains two optional accessories—a momentary switch (B) and a power lamp (D). These are not entirely necessary, but they will enhance both the safety and ease of operation of the fuze.



A miniature travel alarm. Pointer shows alarm contact.

The momentary switch serves to cut the power from the battery to the SCR. This is necessary because the SCR will

not reopen until this power is cut, even though the pulse from the time piece has been interrupted. Any type of on-off switch may be used, but a momentary is easier to use and, usually, smaller.

The power lamp serves to indicate whether there is power flowing through the firing wires that lead to the detonator. It is very important to know whether the detonator is being connected to a live power source, considering the consequences if it is (immediate detonation).

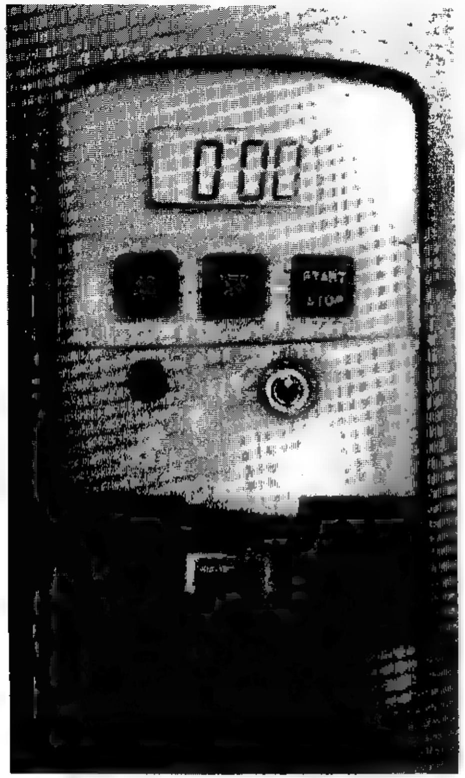
The source for a time piece can be almost any kind of variety store—supermarkets, drugstores, electronic hobbyist stores, or even auto parts stores. I picked up a nice little travel alarm in the accessories section of an auto parts store for $3.50 and another of the same type at a local discount store for $1.50. In the latter case, the battery was almost expended, hence the great price.

Let's take a closer look at the three main types.

1. Travel Alarm—These types are usually pretty small, about 2 to 3 inches long and maybe half an inch thick. If small components are used, all of the additional circuitry can sometimes be fit (with the possible exception of the firing battery) inside of the case. It functions like an alarm clock, so the current time of day as well as the alarm (detonation) time desired must be set.

2. Digital Alarm Watch—This is the smallest of the three and functions as the previous one does, i.e., alarm clock fashion. A wire is run from the alarm contact through the watch case to the SCR. The hole in the case may be sealed if the watch is to work, and the short length of wire concealed under a piece of electrician's tape. The SCR circuit must be housed separately, as there is no room in the watch case to house the components.

3. Countdown Timer—This is the modernized version of the old kitchen timer and is my favorite of the three. This is because it is small and compact, but still large enough to house all of the necessary circuitry *and* the firing battery. It is also the easiest to set up, even if the instruction sheet has been lost.



24-hour Pillbox timer modified with SCR circuit (power lamp, sliding switch, and det jack). This is my original test model of the SCR circuit.

The alarm contact varies with the type of time piece. Watches generally use two small metal tabs that press against a flat disc to produce the alarm sound. The travel alarms generally use the same disc system, but the contacts are a pair of tiny brass springs. The countdown timer uses two wires to the buzzer, which may or may not be of the disc form.

Open the case on the time piece and expose the alarm buzzer. Test with a multimeter to find the positive contact on the buzzer. This is where the gate prong on the SCR is attached.

Construction

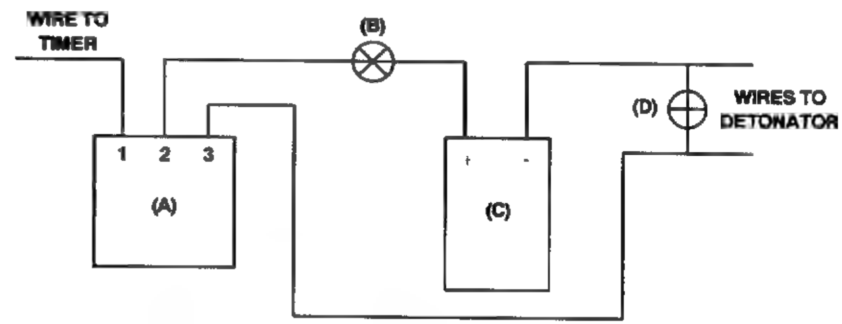
Assembly of this circuit is very simple and really requires no detailed instruction. As an added safety precaution, a safety switch should be added to the det wires. This would allow greater ease and safety in operation, as the detonator could be connected to the circuit and the operative could still set and test the timer with complete safety. Another safety measure is to connect the wires that ordinarily go to the detonator to a miniature stereo headphone jack. The leg wires on the detonator would be attached to a mating headphone

plug. After starting the timer and finding the circuit safe, the detonator is plugged into the jack.

To use:

1. Set the timer or alarm to the desired delay.
2. Check the power lamp to see if there is power to the det wires.
3. If all checks out okay, connect the detonator.
4. Start the countdown.

NOTES: Test the delay a couple of times by connecting a buzzer to the detonator wires. After the delay is complete and the buzzer sounds, the battery must be disconnected or the momentary switch depressed to break power to the det wires by resetting the SCR.



KEY

(A) = SCR
1. GATE
2. POWER IN
3. POWER OUT
(B) = MOMENTARY SWITCH (OPTIONAL)
(C) = BATTERY
(D) = POWER LAMP (OPTIONAL)

SCR Switching Circuit

SHORT DELAY ELECTRONIC CIRCUIT

This device is the result of many months of searching, testing, and aggravation. It is cheap (under $5), relatively easy to build, accurate, and reliable. The problem with

some books of this genre is that they often include devices/techniques that have never been tested. When you try them, they don't work. I don't know about you, but this *really* irritates me.

I am not an electronics expert. I'm a technician—I build things. I have no idea how or why this circuit works. I don't really care. All I know is that it does. The parts are readily available from many sources.

A variety of delays may be obtained, ranging from less than 10 seconds to about 3 hours. It is the simplest timer circuit I've found that is of any use. The only one I've run across that is any better is the E-cell timer circuit used by Abu Ibrahim. That particular circuit has much to recommend it, being simple, tiny, and reliable, but for one fatal flaw—I have yet to find a domestic source for the E-cell (microcoulometer), which is the heart of the device. Pity, as this circuit, properly assembled, could give a long delay timer that would fit inside of a ball-point pen shell. If anyone knows a source for E-cells, please let me know.

I've listed the delays achieved from several different combinations of components to give some examples. There is much room for improvisation and experimentation in this circuit. The length of delay is determined by the values of R-2 and C-1 (see chart).

Let's take a closer look at the component parts now, shall we?

1. R-1 is a fixed resistor, valued at 4.7K. It never changes.
2. R-2 is another resistor and may be fixed, variable, or a combination of the two. The use of a variable resistor (potentiometer) will allow the time delay to be adjusted if necessary, within a certain range.
3. C-1, the capacitor, is a common electronic component. Increasing its value, either alone or in combination with R-2 (preferred), will give longer delays.
4. Capacitors (and resistors) are found in many electronic appliances and may be scavenged from these sources.
5. Q-1 is a 2N3906 transistor. Many different types can be

substituted, so consult with an electronics supplier if you can't find this exact one.

6. 555 IC chip is one of the most popular ICs yet developed and may be found in many different types of circuits. Cheap and versatile.

Before building this or any other circuit, the operative should get ahold of a copy of *Getting Started in Electronics* by Forrest Mims. This book may be found at most local electronics stores. He should build the circuit on a solderless "breadboard" so that he can more easily test the delays and get practice on assembly and layout before trying to solder it together.

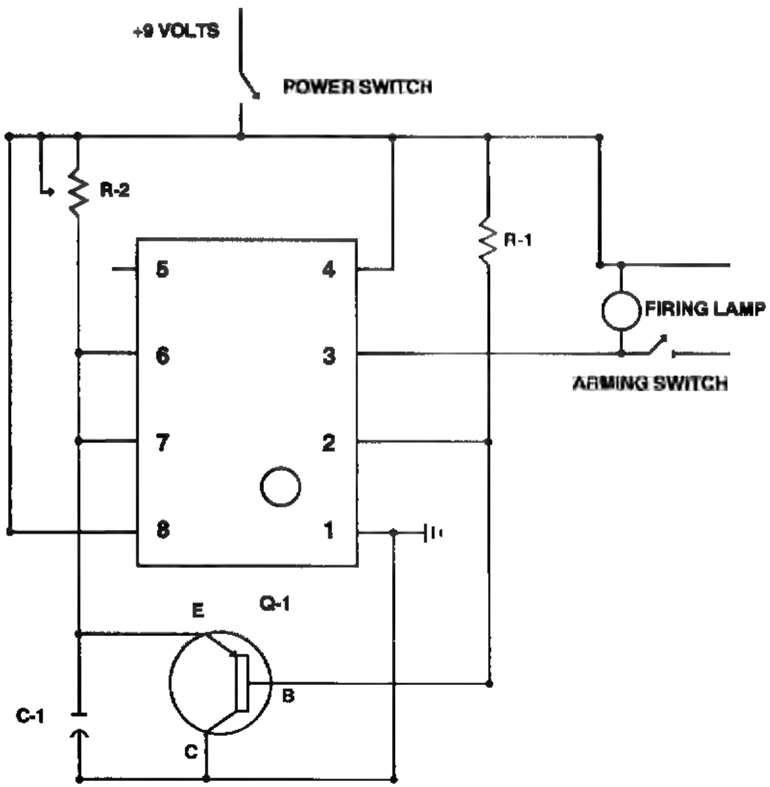
TEST RESULTS

TEST#	R-2	C-1	DELAY	COMMENTS
1	1M	100mf	100 seconds	This would be best for assault demolitions, or where you can make a rapid, unimpeded getaway.
2	4.2M	100mf	9 minutes, 20 seconds	
3	10M	220mf	15 minutes	
4	1M	1,000mf	23 minutes	
5	10M	1,000mf	160 minutes	
6	10M + 3M Var.	1,000mf	180 minutes	

What little background information I could locate on this circuit indicated that it maxed out at 14M resistance and 1,000M capacitance. A good rule of thumb to go by is to raise the value of the capacitor when you raise the value of the resistor to any significant extent. After final assembly, retest the delay time to make sure it hasn't changed. The particular soldering technique used may have added some resistance to the circuit, thereby altering the timing. After everything has

been assembled and tested, it should be smeared with a "potting" material such as epoxy resin (best) or even auto body filler. When the plastic hardens, it serves to protect the delicate electronic components from damage.

Some nice touches to add to this circuit are the addition of a power switch, arming switch, and firing lamp. This enables the assembled device to be carried and armed with maximum safety. Upon arrival at the site, the power switch is activated. If the red firing lamp doesn't light, the arming switch is flipped on. The bomb is now activated and will fire after the expiration of its delay.



Short Delay Electronic Circuit

LONG-RANGE ELECTRONIC TIMER

This device is similar to the previous one in that it uses a 555 IC chip as its heart. Extensions in delay are obtained by adding on 4017 Decade Counters. The 555 is wired so that it will periodically emit a pulse to the 4017. After receiving 10 such pulses, the first 4017 will pulse to the second 4017, which will also count 10, then pulse. In this manner, each successive 4017 will multiply the time delay of the previous chip by a factor of 10. As many 4017s as needed can be added, but, as shown in the example, five decade counters will provide over two months of delay.

The base time (the frequency of pulses emitted by the 555) is varied by altering the component values, as in the previous example. Do not be tempted to use large-value components (as in the previous example) to avoid using more decade counters. This is not exactly the same kind of circuit, and large-value components may introduce instability into the circuit and cause the operative many headaches. I assume a *reliable* delay is desired. The calculation chart shows how to determine the delay from the values of the components.

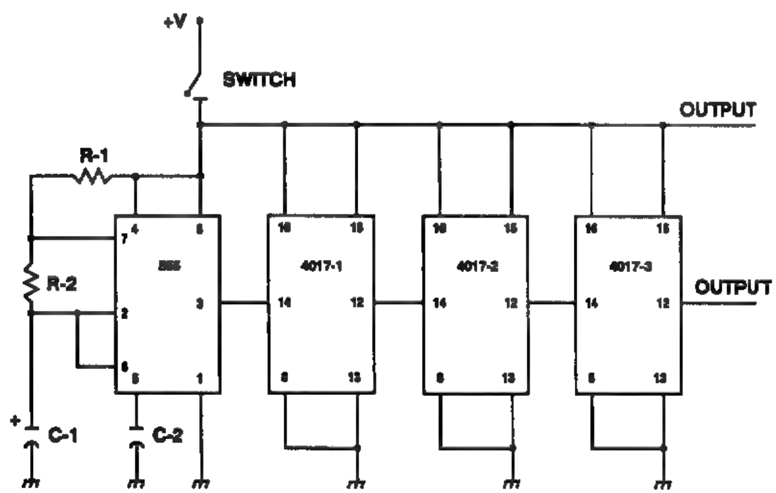
CALCULATION CHART

EXAMPLE
F = (Frequency of output)
0.693 (constant value for 555 IC)
x 0.0001 (C-1, 100-uf capacitor)
x 1,000,000 (R-1, 1M resistor) + 2 x 4700 (R-2, 4.7K resistor)
OR
F = 0.693 x 0.0001 x 1,009,400
OR
F = 69.95 seconds

Each 69.95 seconds, the 555 will send a pulse to the 4017 chip and automatically reset itself. After 10 pulses are received (a time delay of 699.5 seconds, or about 11 minutes, 39 seconds), it will send a pulse to the second 4017 and

reset. After the second 4017 has received 10 pulses (a time delay of 116.5 minutes), it will emit a pulse and reset. And on and on, depending on how many 4017s are used. I've included a short list to show the possibilities for a given set of components. REMEMBER: the components can be altered to achieve the required delay.

EXAMPLE
555 + 100-uf capacitor (C-1) + 1M resistor (R-1) + 4.7K resistor (R-2) 555 = 69.95 seconds
4017-1 = 699.5 seconds, or 11 minutes, 39 seconds
4017-2 = 116.5 minutes
4017-3 = 19 hours, 25 minutes
4017-4 = 194 hours, 18 minutes, or approximately 8 days
4017-5= Approximately 80 days.



Long-Range Electronic Timer

As one can see from this and the illustration, quite a long delay timer can be made that will fit into a small package. If an extremely long delay is desired, say more than a week or so, the batteries must be up to the job. If the bomb is to be fitted into

the wall of a structure (as in the Brighton Bomb), a common AC adapter/transformer of the appropriate voltage may need to be modified and wired directly into the building power net. This is coupled with some rechargeable ni-cad batteries to deal with any interruption in the power supply. It is even possible to install such a bomb while the building is being erected. When the power supply is switched on, the timer will begin its countdown. (The two output leads might not emit sufficient power to detonate the blasting cap. If so, an SCR circuit can be attached to the final 4017, pin #12. This should do it.)

NOTE: C-2 is a 0.01uf capacitor that functions as a stabilizer for the circuit. Its value never changes.

A Microelectronic Delay Device

The world of microelectronics continues to grow at an astonishing pace. Devices that had to be desktop 15 years ago are now small enough to fit into a cigarette pack with room to spare. A case in point is the Radio Shack EC331 pocket calculator/directory. I received one of these as a birthday present last year and immediately fell in love with it. It is small—about the size of a cigarette pack and about 5/16 inch thick—and comes with a 70-page instruction booklet to cover its myriad functions. More importantly, its circuitry contains no less than three separate timers—an "alarm clock" type timer, with up to a 24-hour delay; a countdown timer, also with up to a 24-hour delay; and a schedule timer, capable of supplying up to a *one year* delay. This last feature almost caused actual sexual arousal. All three functions may be easily adapted using the same SCR circuit, providing up to a one year delay for about $20. It is even possible to program all three timers (if a 24-hour or less delay is required) to go off at the same time, thus providing a double backup. It is the most versatile piece of equipment I've seen come down the pike in a *long* time.

If you want to really go whole hog, the EC331 has another interesting feature—a separate backup battery. This is the same 3-volt lithium cell used to power the main circuit, and it is used to protect the memory when changing the main battery. It also contains more than enough power to

initiate an electric blasting cap. With careful selection of momentary switch, lamp, and SCR, the operative can fit all of the firing circuitry within the case and have a truly compact and elegant device.

Before we conclude, a final note to ponder. The timing circuit in this device is only a small portion of all its functions. A skilled and talented designer could build something much smaller, given the proper materials.

BATTERIES

Only fresh new batteries should be used in *any* electrically powered explosive device. If any cold weather exposure is expected, alkaline batteries should be used as a matter of course. With respect to batteries, anything below 50°F is considered cold. Alkaline batteries will give good service from about -25°F to +125°F. However, if the weather is extremely cold (below 0°F), batteries could be insulated. Expanding foam insulation, the kind that comes in a can, works well to fill the voids in the device and provide this needed insulation. That any electric circuit should be protected from moisture goes without saying.

If extremely hot temperatures are expected, the aforementioned insulation will work to keep the circuit and batteries cool. As mentioned, alkaline batteries are reliable up to +125°F; however, this upper operating temperature applies to the temperature of the component, *not* the temperature of the air around it. For example, if the thermometer reads 85°F in the shade (air temperature), an item sitting in the direct sun could easily exceed the 125°F limit.

If an explosive device is to be exposed to the sun for extended periods of time, a nonmetal covering, such as a cardboard box, with ventilation holes punched in the sides should be used. Believe it or not, a few air holes can make a difference of 20 to 30 degrees compared to an identical unventilated box.

Always try to store batteries in a refrigerator, if one is available. Cold storage greatly extends the shelf life of batteries, while high-temperature storage shortens it.

CHAPTER 4 PIPE BOMBS

It seems to be in vogue these days to look down on pipe bombs as crude, amateurish noisemakers. Nothing could be further from the truth. A properly made and employed pipe bomb can be very destructive when utilized against both personnel and materiel in an unconventional warfare setting. It has long been a favorite of revolutionaries and maniacs throughout the world. George Metesky, the shy, retiring Brooklyn resident who gained fame in the 1940s and 1950s as the "Mad Bomber of New York" used them exclusively in his 17-year stint of antisocial behavior. On one occasion, the IRA built a bomb consisting of five large pipe bombs housed in a wooden crate. Each bomb contained about 3 pounds of a sodium chlorate and sugar mixture. The crate was placed against the wall of a Protestant-owned pub in Northern Ireland. When it went off, it blew a 3-by-4 foot hole through the 18-inch-thick exterior wall and totaled the interior of the pub.

The pipe bomb's function is to contain the hot, burning gases of the low explosive powder until sufficient pressure is built up to burst the casing. The faster this occurs, the more powerful the bomb is. The pipe itself will usually tear and rip into several large pieces when a low explosive is used. A high explosive filler will fragment the casing into many smaller pieces. In this case the pipe body serves as a fragmentation jacket.

Construction of the bomb is very simple but should still be approached with the same respectful care given to all things explosive.

PARTS

1. Bomb Body—The main part of the pipe bomb is, naturally, a piece of pipe. It may be steel, iron, or any other good, strong metal. The ends of the metal pipe are closed by threaded caps or plugs.

One of the greatest dangers is getting grains of the explosive powder trapped in the pipe threads. Friction from screwing on the end caps or plugs may cause them to ignite, with predictable results. A toothbrush should be used to clean the threads off, or the pipe lined with a plastic bag to prevent this.

Whether plugs *or* caps are used, this is *very* important. With plugs screwing internally into the pipe body, some powder is more likely to be trapped. A hole could be drilled and tapped in one of the caps, the bomb assembled, and, using a funnel, the powder poured through the smaller hole. Tap the body of the bomb gently with a wooden block to promote settling of the powder and, when it's full, screw an appropriately sized bolt in the hole to seal it. Use a brush to clean out the threads on the small hole, and coat the threads on the bolt with Vaseline to reduce friction. Kurt Saxon recommends the use of bondo (auto body filler) plugs to replace the caps. This is much cheaper than using threaded plugs or caps and is actually safer to construct.

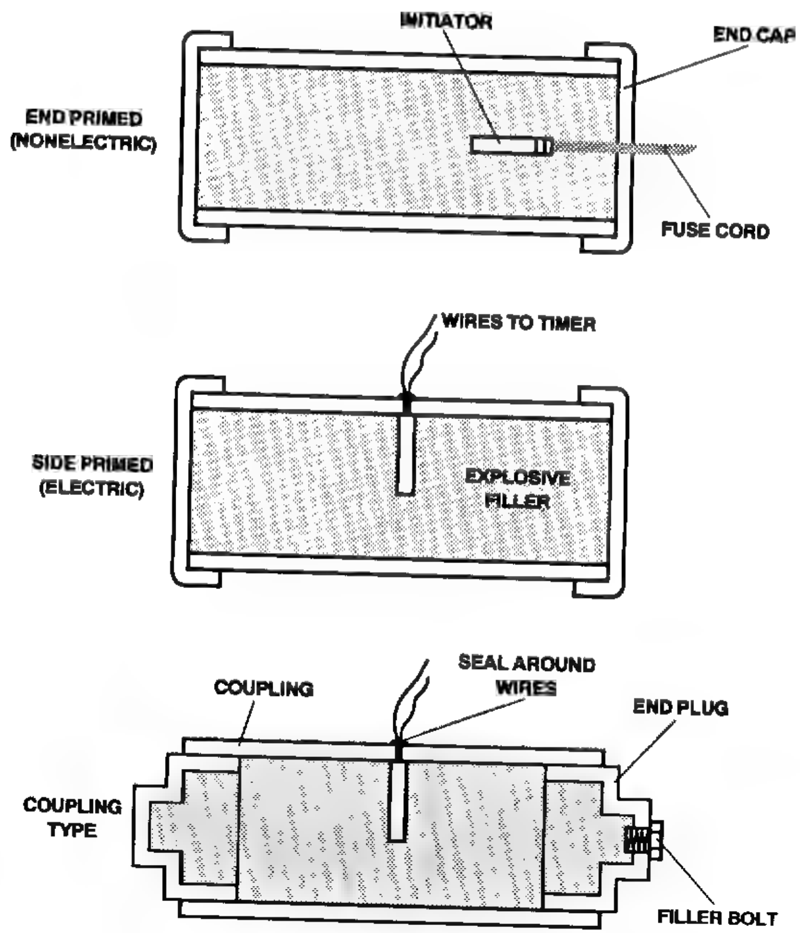
Another type of pipe bomb may be constructed from two pipe plugs and a threaded pipe coupling. Metesky built his bombs in this manner, with the fuzing systems completely enclosed. This type should *always* be lined with a plastic bag and the threads of the closing plug *always* coated with Vaseline.

The West German RAF used a novel type of pipe bomb in their early days. Instead of using plugs or caps to close the ends, they welded flat plates of steel on them and used a small threaded coupling to fill it. A small home arc welder is adequate for the job.

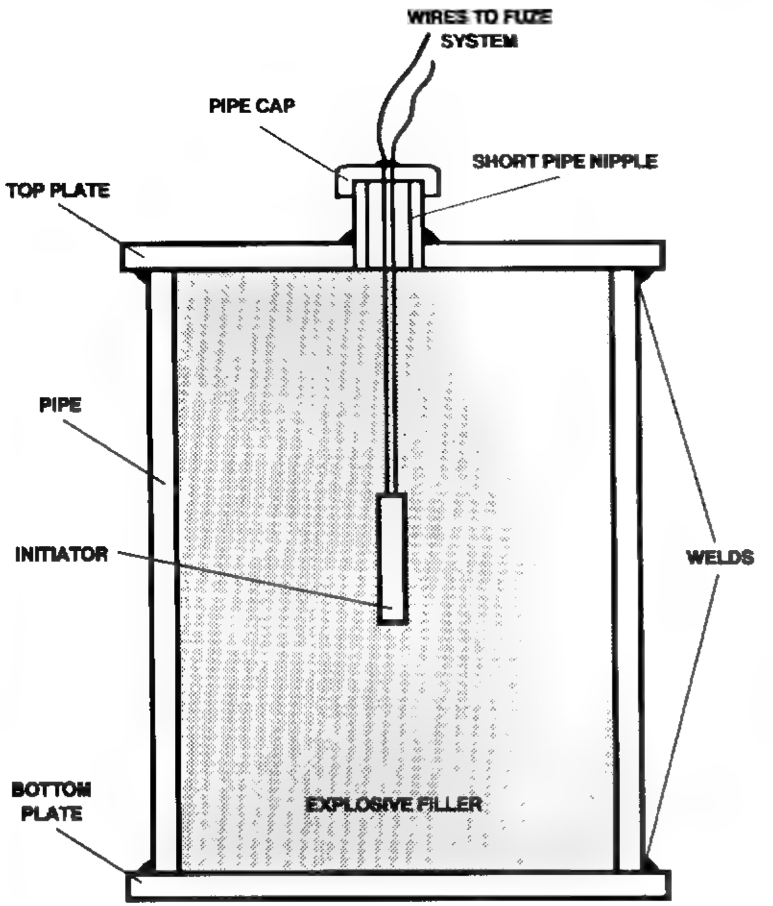
Plastic PVC plumbing pipe has given good results but requires the use of a very fast-burning filler for optimum

power, as it cannot contain the same level of pressure as metal pipe before bursting. The end caps are glued on using PVC pipe cement.

Another novel type of "pipe" bomb is the one which requires no pipe at all! A low-explosive filler is sealed inside a thick plastic bag, tin can, or even glass bottle. The container is then cast inside of a jacket of hard concrete, epoxy, or bondo (see illustration). Properly made, it can exhibit great power.

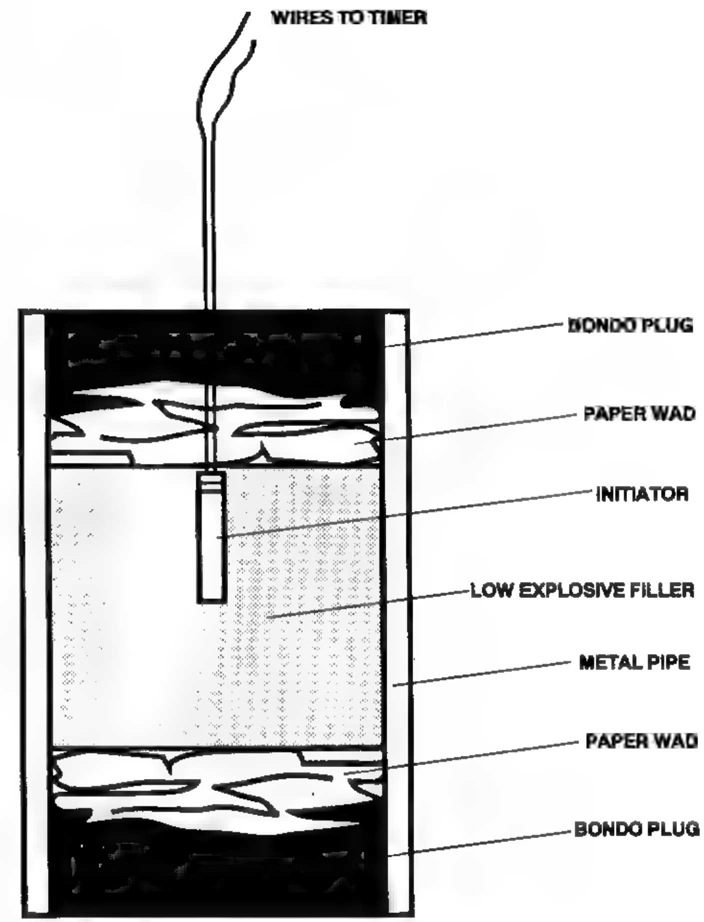


3 Variations of Pipe Bombs



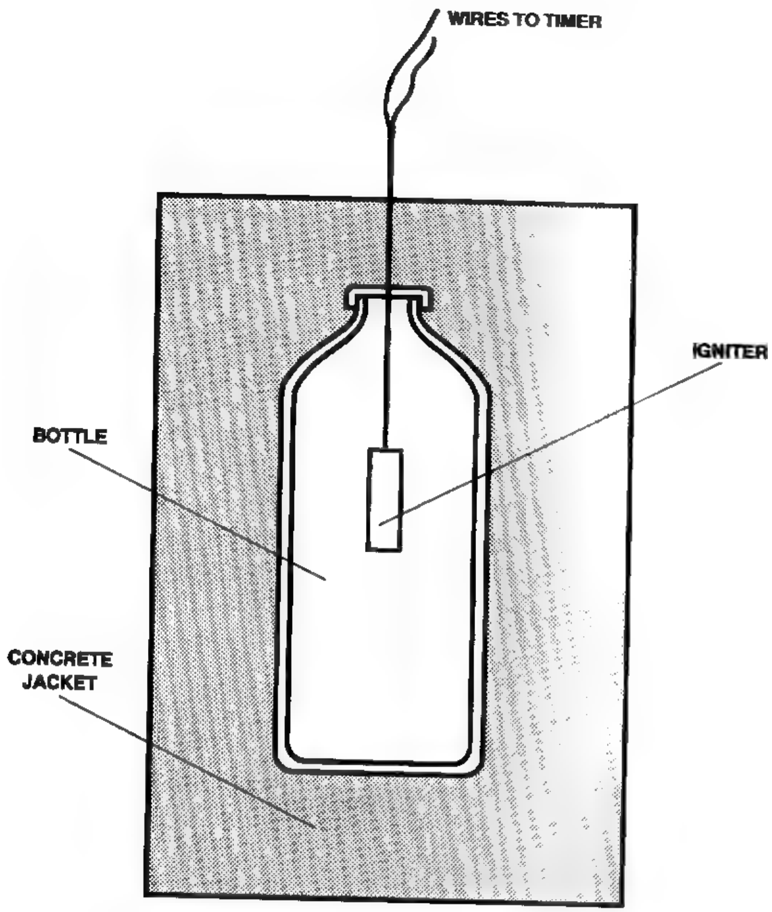
Early RAF-Style Pipe Bomb

The pipe caps in this particular variant were replaced with steel plates welded on the ends. This is much cheaper than using pipe caps and actually makes the bomb safer to load. A hole is drilled in the top plate and a short piece of pipe nipple is welded in place. It is loaded by pouring the powder in through the nipple, inserting the initiator, and screwing on the small cap.



Bondo Bomb

The pipe is first stuffed full of paper, except for the last inch or so of depth. The bondo is mixed and spread into this void until it is even with the end of the pipe. It is allowed to harden, after which the paper wad is removed from the other end. The low explosive charge and initiator are well sealed inside several plastic bags and placed inside the pipe. Another paper wad is placed over this and covered with another layer of bondo. When the bondo has hardened, the bomb is ready to incorporate into the rest of the device.



Concrete Bottle Bomb

EXPLOSIVE FILLERS

1. Low explosives—Low explosives are probably the easiest to procure and use. Since only a flame source is needed for initiation, the fuzing system can be very simple. Both black and smokeless gunpowders are readily available commercially, and many improvised formulas are quite easy to make, providing care is used. A few of the simpler are listed in the manufacturing section.

A. Gunpowders—Of the three main types, fine-grained double-based powders such as Bullseye are preferred. Single base is adequate but is much better if reprocessed into guncotton.

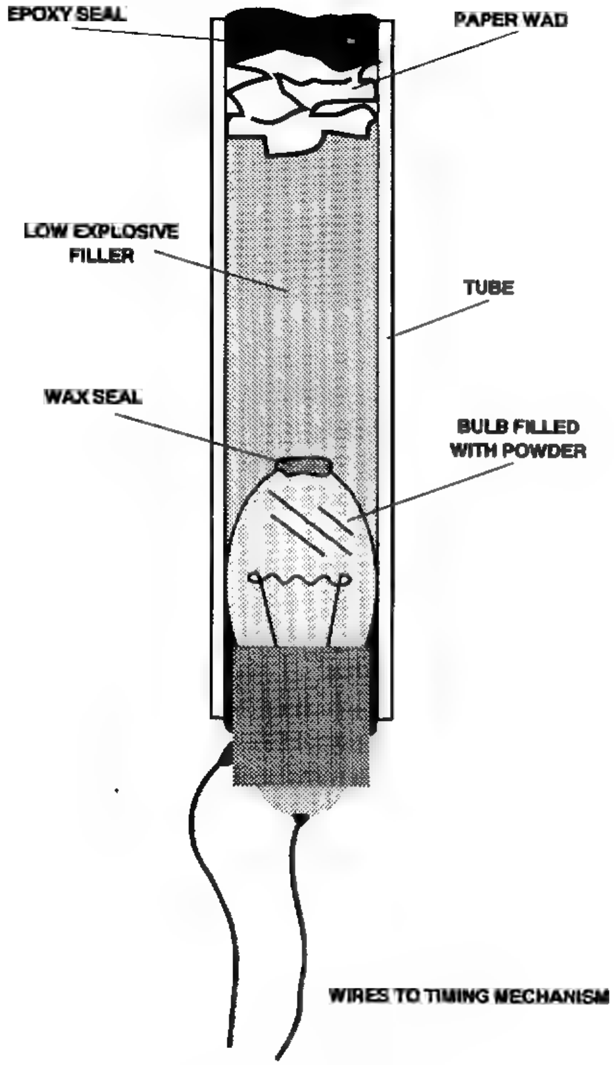
B. Chlorate/Sugar Mix—A 50/50 mix of potassium or sodium chlorate and sugar makes an excellent filler, fast burning and powerful. If sodium chlorate is used, the mixture will tend to be hygroscopic.

C. Photoflash Powder—Though no longer commercially available, this powder is *very* easy to formulate and very powerful. It is also, unfortunately, very sensitive to sparks, even from the static charge that the human body stores during certain types of weather. Therefore, special precautions must be taken when handling.

During formulation and loading, I recommend wearing a grounding wire. This is a length of insulated copper wire that is bare at each end. One bare end is looped around one wrist and the other is attached to a grounded object such as a water pipe. This will prevent static buildup and its accompanying sparks. Commercial variants are available for working on delicate electronic computer components that are also very sensitive to this static buildup.

D. Ammonpulver (AP)—AP is a mixture of finely powdered ammonium nitrate and charcoal. It is very hygroscopic but also very powerful. Properly and carefully made, it is the filler of choice for a low-explosive pipe bomb. Details are covered in my previous work, *The Advanced Anarchist Arsenal*.

2. High Explosives—I won't go into detail about the many different types of high explosives that may be used in pipe bombs. Since they don't have to be tightly enclosed to explode, the pipe serves only as a sturdy container and fragmentation jacket. Explosives such as TNT or Pentolite may be melted in a double boiler and cast into the pipe, providing the same precautions to avoid friction are taken. Malleable explosives, such as dynamite or plastics, may be unwrapped and hand-pressed into the pipe, using a wooden rod as a tamper. They, of course, will require a blasting cap for initiation.



Homemade Squib

FUZING SYSTEMS

The fuzing system is the "match" which lights the explosive filler. Any of the many timers listed will serve admirably to provide delay. A high explosive filler will, of course, require a blasting cap, while low explosives need what is known as a "squib." A squib is a small metal tube, resembling a blasting cap, which contains a small quantity of black powder. When initiated, it emits a jet of flame out the end of the tube and ignites the low explosive filler. Commercial squibs are fairly rare nowadays, as little black powder is still used in commercial blasting. Fortunately, they are very easy to improvise.

To make a squib, take a small light bulb, such as is used in a flashlight, and solder two wires to the contacts on the base. Carefully file a small hole in the tip of the bulb. Fill the bulb with a finely powdered, fast-burning low explosive, such as flashpowder. Seal the hole with a gob of wax. Slip a small metal, plastic, or cardboard tube over the bulb and glue in place with epoxy. Fill the tube almost full of low explosive, such as potassium chlorate/sugar mix. Place a small wad of paper over the filler and seal the end with wax or epoxy. You have just made what amounts to a tiny bomb and should handle it accordingly. It will ignite any low explosive, especially the hard-to-light ones like Ammonpulver.

The best place to locate the squib is in the center of the low-explosive filler. This simple step alone will decrease the burning time 50 percent and thus increase the power of the blast.

PVC PIPE BOMBS

A bomb made from PVC pipe has a couple of advantages over one made from steel pipe. The pipe and caps are cheaper, lighter, and require no threading. Special construction techniques may be tried, such as reinforcing the end caps with sheet metal screws, but remember that the strongest part of a PVC pipe assembly is a properly cleaned, lubed, and cemented joint. It has roughly twice the strength to contain pressure, and greater tensile strength, than the pipe itself.

If sheet metal screws are to be used, then start by gluing one end cap on the pipe. Drill 6 to 8 holes through the side of the cap and pipe big enough for the screws. Screw these in place tightly. Slip the second end cap on the other end, but don't glue it on. Drill the holes for the screws, as before, but don't screw them in. Remove the cap and cover the holes inside the pipe with masking tape. Drill a small hole in the center of the pipe for the igniter wires. Thread the wires through the hole and seal it with epoxy. Pour the low explosive filler into the pipe until full. Coat the cap with glue and slide it onto the pipe. Make sure that the holes in the cap line up with the holes in the pipe. When the glue is dry, dip the screws in lubricant (oil, Vaseline, etc.) and screw them in. The oil reduces the friction and a possible source of accidental ignition. The bomb is now complete.

CASTING EXPLOSIVES

TNT and the TNT-based composite explosives may be easily cast into various items either to evade security measures or simply to convert them to a more convenient form or size. The anti-Castro Cubans have long been fond of melting down commercial Pentolite boosters for use in their mines and bombs.

Common U.S. explosives that can be melt-loaded include:

1. Tritonal (TNT/aluminum powder)—Used in aerial bombs.
2. Composition B (PDX/TNT)—Used in aerial bombs, shaped charges, and some commercial boosters.
3. Pentolite (PETN/TNT)—Used in shaped charges and commercial boosters (high-density primers).

The explosive must be crushed into small pieces or powder before melting. If military TNT blocks are used, it must first be removed from its outer container. Carefully cut around the top of the cardboard sleeve, just below the metal end cap. Slide the blocks of TNT out of the sleeve and place

them in a heavy canvas bag. Pound the bag with a wooden mallet until it is crushed thoroughly.

If commercial boosters (high-density primers) are the source, they must first be soaked in a bowl of warm water. This will soften up the paper packaging so that it will may be removed more easily. Crush as with TNT blocks. The explosive will most likely be Pentolite, though some manufacturers use Composition B. Both are light yellow crystalline solids, so without chemical analysis one won't be able to tell the difference. Since they both possess about the same level of power, it doesn't really make much difference. Pentolite will be a bit easier to detonate. (The removal of explosives from aerial bombs and artillery shells is covered in *The Advanced Anarchist Arsenal*.)

Place the explosive powder and pieces into the upper pan of a double boiler. This may be improvised by suspending a *small* can containing the explosive inside a larger can of water. Make sure that the inner can does not contact the outer one. Place on a heat source and heat the water almost to boiling. TNT and the composite explosives melt at about 80°C. *Never* allow the molten explosive to boil or heat any more than is necessary to melt it completely. TNT has a flashpoint of 106°C, at which point it may explode, so watch the temperature. Molten TNT is also quite sensitive to shock, so any rough handling is a no-no.

Stir the explosive while it is melting with a wooden stick. When it has melted completely, remove the inner can from the boiler and wipe it dry. Continue to stir the explosive while it cools until it thickens considerably. Pour into the mold or charge container. TNT may shrink as much as 12 percent upon cooling, and a crust will form over the top. Break the crust and add more explosive as many times as necessary. The longer the explosive is allowed to thicken before pouring, the better, as this substantially decreases the amount of shrinkage. If stirred too long, however, it will thicken so much that it will be difficult, if not impossible, to pour properly.

Another way to deal with the shrinkage problem is to

use the "seed crystal" technique. Take some of the powdered TNT and dissolve it in a little hot acetone. Let it cool, then pour this solution into at least four times as much water and stir vigorously. Pure TNT crystals will precipitate out of the solution and settle to the bottom of the container. Filter out the crystals and dry them thoroughly. When stirring the cooling explosive in preparation for the casting, add the crystals at a proportion of about 1 to 10 parts molten explosive. Continue stirring and pour into the mold. If done properly, shrinkage will be negligible.

Before the explosive has cooled fully, form a cap well by placing a smooth 1/4-inch-diameter rod into the center of the mass to a depth of about 1 to 1 1/2 inch. Remove the rod when it has hardened completely. If TNT is used, the cap well can be drilled with a hand drill. *Never* drill Pentolite or Comp B. Pentolite in particular is *very* sensitive to the friction of drilling and could explode.

Anything that can withstand the heat of the molten explosive may be used as a mold. The Cuban exiles used old cigar boxes on several occasions. For items such as statues, ashtrays, etc., the techniques and equipment used in the plaster casting hobby are entirely suitable. Painting of these types of items is usually required, as none of the cast explosives even remotely resemble plaster of paris. This will also seal its surface to reduce the chance of detection by explosive "sniffers."

NOTE: Cast TNT will need a more powerful detonator than will Pentolite or Composition B. If a U.S. Army Engineers blasting cap is unavailable, use two commercial No. 8 caps side by side.

CHAPTER 5 MANUFACTURING EXPLOSIVES

The actual manufacture of explosives is possibly *the* single most dangerous aspect to this work. Improvised explosives are, as a rule, more sensitive than commercial or military types. Therefore, one *must* be much more careful in their handling. A few simple pieces of equipment will make the operation much safer. A few more will make it safer still. We'll cover the *mandatory* basics first.

1. Goggles—Eye protection is a must. Not only are most of the chemicals potentially damaging, but the risk of accidental fire and/or explosion is *very* real. It has happened to all of us at least once. You can pick up good goggles at a college bookstore or supply store, where they are carried for, surprise, the chemistry classes. They are exactly what you need.

Personally, I keep a modified welder's mask for such work. The smoked glass in the hood has been replaced with Plexiglas. More expensive than goggles, but also more protection.

2. Gloves—These are a little different story. No single type of gloves are adequate to protect you from all of the potential hazards in the lab. Good butyl rubber gloves are mandatory when working with strong acids and some oxidizers. Not all of the chemicals are harmful to the skin, but one shouldn't take any chances. A small grain stuck under the fingernail could find its way into the eye or mouth when they are rubbed. This is less likely to occur when wearing gloves. I accidentally got a little sulfur into a cut in my hand when not wearing gloves. The pain was intense. I later found out that the KGB used a variety of sulfur in interrogations.

Kitchen gloves are an adequate substitute. If spark- or friction-sensitive chemicals such as flashpowders are to be handled, I'd recommend thick welder's gloves. They don't have the flexibility of rubber gloves, but they will easily handle the flash of a small batch of powder exploding. Nomex pilot's gloves are fine, but expensive.

3. Apron—This is preferred over the more conventional lab coat, as it is much easier to rip off if it gets splashed with chemicals or catches fire. It should be made of a good, heavy cloth, preferably fire-resistant material.

4. Fire Extinguishers—Self-explanatory, but have two handy.

5. Dust Mask—These will protect against the flying dust hazard common with some chemicals.

6. Absorbents—This is necessary in case of spillage. Kitty litter works for most liquids and, if a box of baking soda is added to it, is useful for small amounts of acids. Chalk is a good additive, too.

These are the basics, the equipment the operative *must* have. Another good item is a fume hood. This draws the fumes from reactions and exhausts them out a flue. The manufacture of many good explosives are comparatively easy, but it will emit noxious fumes. A fume hood is simply a box 3 feet wide, 2 feet high, and 18 inches deep. Mounted in the top is a good sparkless fan capable of a 100-cubic-feet-per-minute air flow. It is *indispensable* for some processes and can be built easily from sheetrock or 3/4-inch plywood. Line the bottom with sheet metal and coat the interior with epoxy paint.

LAB RULES

1. Remove all watches, rings, jewelry, etc., before starting work.

2. Wear close-fitting clothing. No ties, loose belts, hats, etc. Tie back long hair. No synthetic clothing should be worn. It melts.

3. Always work with a partner. In addition to being able to

pass chemicals as you need them, he can rescue you in case of an accident and administer first aid. I'm not kidding.

4. Keep the fire extinguishers handy and ready.

5. Work in a clean, uncluttered area. This means that if you are working on a bench or table, then *only* those things you need at that moment should actually be *on* the table. If an accident occurs, the fewer items involved in it, the better. Your partner can bring you things as you need them. No clutter on the floors, either. You wouldn't want to trip over something while carrying the batch of nitro that has your undivided attention or otherwise want anything in your way when you are trying to get away from the flash fire on your work bench. I'm not kidding.

6. Use only nonsparking utensils. Plastic or wooden spoons and ceramic bowls. A stainless steel mixing bowl is permissible *only* if used with a rubber, plastic, or wooden spoon or spatula.

7. Avoid any rough or abusive handling of chemicals, except in the specific grinding steps listed.

8. Avoid contact with skin and inhaling the vapor or dust generated when grinding chemicals.

9. Never use power grinders to speed things up *except* in those cases where it is *specifically* mentioned as safe. Actually, I'd feel better if you used hand grinding in those cases, too.

10. Don't "experiment" with untried mixtures. Some additives can decrease or increase the sensitivity of explosives. *Some will explode on contact.* I don't know all of the potentially dangerous combinations. Neither do you. So don't play Mad Scientist.

LOW EXPLOSIVES

Most low explosives are simple mixtures of two different ingredients—an oxidizer (substance rich in oxygen) and a fuel (combustible substance). The ones we will be examining are the simple combinations that require no more complicated processes than simple mixing. First, we

will cover a short list of rules to make this safe and effective.

1. Always wear protective goggles when mixing. Due to their friction and shock sensitivity, ignition could occur at any time.

2. Work in small batches to reduce damage if ignition occurs. Store completed batches away from the mixing area and combine when needed.

3. Grind each chemical into a powder, *separately*, in a clean glass, wooden, or ceramic bowl using a rounded wooden stick as a pestle.

4. Never use the same bowl for grinding both ingredients unless it has been *thoroughly* cleaned first. Never use the same pestle, as these are very difficult to clean completely.

5. Grind the ingredients with a firm rotary motion, keeping your face back away from the bowl in case of accidental ignition.

6. Never use metallic tools, as a spark could cause premature ignition.

7. All chemicals must be completely dry and finely powdered before mixing.

Place the weighed ingredients on a large sheet of paper. Carefully stir the mixture with a plastic or wooden spatula, then raise and lower the corners of the paper to mix it further. Continue this process for several minutes. The ingredients may also be placed in a carefully sealed paper bag and shaken for several minutes. Do not store the mixtures for any longer than is necessary. It is usually wise to make them up just prior to loading for maximum safety. Make small sample batches first to test the burning rate and sensitivity.

Low Explosive Mixtures
(NOTE: All parts are by weight)

CHLORATE POWDER
1 part potassium chlorate
1 part sugar

FLASH POWDER
4 parts potassium perchlorate
1 part aluminum powder
1 part sulfur

7 parts potassium perchlorate
5 parts aluminum powder

BANGOR (firecracker powder)
6 parts potassium nitrate
3 parts aluminum powder
1 part sulfur

4 parts potassium nitrate
1 part aluminum powder
1 part sulfur

PERMANGANATE POWDER
3 parts potassium permanganate
2 parts aluminum powder

POTASSIUM CHLORATE PRODUCTION

The easiest method of home chlorate production is the conversion from calcium hypochlorite (HTH swimming pool chlorinator). HTH is about 65-percent calcium hypochlorite and is commonly found throughout the warmer areas of the United States. There are several different compounds available to chlorinate swimming pools, but calcium hypochlorite is the *only* one to use. Always check the label, and *accept no substitutes!*

The HTH is converted to potassium chlorate by adding what is known as a potassium donor, which may be either potassium carbonate (potash), potassium chloride (salt substitute), or potassium sulfate (garden fertilizer). In the reaction which occurs, the calcium in the HTH will convert to either the carbonate, chloride, or sulfate, depending on what was used as the donor. All of these calcium com-

pounds are insoluble in water and will drop out of the solution in step 3.

1. In a large Pyrex or enameled steel pan, place 450 grams (a 1-pound bag) of HTH and 84 grams of the potassium donor.

2. Add boiling water, using just enough to dissolve the powders completely.

3. Place the pan in a heat source and boil it until it reaches a specific gravity of 1.3 (full charge in a battery hygrometer). A chalklike substance will form and drop out of the liquid.

4. Filter the liquid while it is still hot. Discard the solids in the filter. This is the calcium compound mentioned.

5. Allow the solution to cool to room temperature. As it cools, the crystals of potassium chlorate will precipitate from the solution.

6. Return the liquid to the heat source and repeat steps 3 to 5 twice more to recover more chlorate crystals.

7. Combine all of the recovered crystals and dissolve them in the minimum amount of boiling water. Filter and allow to cool. This will remove most of the calcium and sodium contaminants.

NOTES: Experience is a great teacher. When I first tried this process, I discovered that when a coffee filter (the most commonly used filter paper in this line of work) is used in step 4, it lasts exactly .235 seconds before it disappears. I mean it was *gone!* Little white traces of mush may be left in the filter holder, but that's about it. I routinely use the filter holder from an old coffeemaker for all of my filtrations, so I looked about for a suitable substitute that wouldn't dissolve in the hot chlorate solution. A fiberglass cloth pad, carefully cut to fit, works fine, but I found a substitute I liked a bit better—an EEC canister filter. Sold at auto parts stores, it looks like a flat pad of fiberglass that has been compressed. It fit my filter holder exactly.

CHLORATE EXPLOSIVES

Mixtures of potassium or sodium chlorates and wax or

Vaseline have long been used as an easily made and fairly powerful explosive. A mixture of 9 parts potassium chlorate and 1 part Vaseline, known as "Composition M," has gained fame from its inclusion in the IMP Handbook (see Recommended Reading). There is evidence, however, that this mixture predates even that august work and was in use with the Algerian FLN guerrillas in the mid to late 1950s. The French used several mixtures called "Minelites" as demolition explosives around the turn of the century. Minelite B contained 90-percent potassium chlorate, 7-percent wax, and 3-percent Vaseline. When pressed at a density of 1.3 grams/cc, it had a detonation velocity of about 12,000 feet per second, equivalent to 40-percent ammonia dynamite. Another similar mixture was 9 parts potassium chlorate and 1 part wax.

Whichever variation is chosen, it has been found that 10 percent by weight of hydrocarbon fuel offers balanced combustion. If homemade chlorates are used, the blocks should be made up only as needed. This is due to possible sodium or calcium contaminants left over in the crystals, which makes their storage life uncertain. If commercially produced chlorates are used, they have a very good storage life.

1. Whichever formula is chosen, the chlorate must be finely powdered, like flour. If it is not, there may be problems getting it to detonate from a single blasting cap.

2. The hydrocarbon fuel must be distributed evenly throughout the chlorate powder.

3. The block should be pressed to its proper density—1.3 if potassium chlorate is used or 1.5 if sodium chlorate is used. This is very important if optimum performance is to be obtained from the explosive. Although the potassium chlorate/Vaseline mixture is touted as a plastic explosive, it is still wise to do this.

A block or stick press, such as is covered in the homemade plastic explosive section, will be required. You may need to improvise a hydraulic addition to the press. Also, the task will be made much easier with a pan heater. This may be built up easily from scrap lumber and hardware fittings.

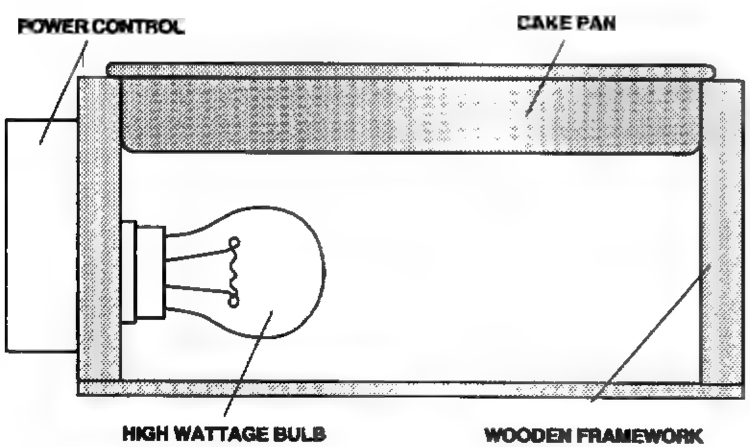
Block Production

1. Place the fuel in a heated pan on a double boiler and allow to liquefy. I have found that a small cup heater, used to keep your cup of coffee nice and hot while you drink it, works well for small amounts of wax and/or Vaseline.

2. Place the finely ground chlorate in the heater pan. Spread it out in an even layer and let it heat for several minutes to drive off any acquired moisture.

3. Pour the melted fuel as evenly as possible over the crystals. The heat from the pan should cause the fuel to distribute itself throughout the chlorate, but a little stirring with a spatula may be necessary.

4. Remove the pan from the heater and allow the mixture to cool somewhat. Rub the soft chlorate through a piece of screen to form granules.



Pan Heater

The framework can be built from scrap wood to whatever size is appropriate. The pan rests on its rim and has the bottom painted black to absorb the heat from the bulb. A rheostat or power control may be used to vary the heat, or the operative can simply experiment with different wattages to find the one he needs.

5. Place granules in the press and process as covered in the plastic explosives section. NOTE: If sticks are being made, they could be pressed and packaged in the thin PVC tubes. The ends may be sealed with the plastic tube caps or dipped in wax. The extra rigidity afforded by the tubes seems to increase the reliability of detonation.

AMMONIUM NITRATE EXPLOSIVES

Ammonium nitrate is arguably the single most important chemical in improvised explosives production. It may be manipulated in various ways not only to form explosives but also to be converted into various other chemicals useful in this work. Even if it weren't so easy to procure (it is widely used as an agricultural fertilizer), it would still be an invaluable material.

The most basic AN explosive is called ANFO (ammonium nitrate/fuel oil). AN fertilizer comes in the form of prills (pellets) that can be mixed in a proportion of 96-percent AN and 4-percent fuel oil to form ANFO. The only problem with ANFO is that it requires a booster of about 1 pound of TNT or its equivalent to detonate. It is best if the booster is in the form of a short, squat cylinder, like a food can, rather than a stick.

ANFO has been in commercial use since the early 1950s and is now the most widely used blasting agent in this country. It has found the most covert use in car bombs, where it is used in *large* quantities. ANFO in such quantities is best prepared in a small cement mixer. The AN is poured into the mixer with the required amount of fuel oil (100 pounds AN per gallon of fuel oil if powdered AN is used, or half that if fertilizer prills are used). Tumble the mixture for 20 or 30 minutes, or until a homogenous mixture is obtained. If a box of commercial laundry detergent is added to the mix (1 pound per 100 pounds AN), the performance of the explosive can be increased substantially, usually by up to 30 percent. A couple of pounds of aluminum powder can improve it even more.

Pour the completed mixture into the charge containers, insert the booster charges, and seal. The larger the booster, the better. If a 55-gallon charge container is used, I would recommend using at least a 10-pound booster. If possible, place the booster as near to the center of the charge as possible. A good, strong booster can accelerate the detonation speed of the main charge substantially; a weak booster can reduce it.

If the AN is powdered, it will exhibit a higher velocity. A hand or power flour grinder, set at its lowest speed, will work fine for this, but *be sure* to watch for excessive heat buildup, and stop it to let it cool every few minutes. When you are through, wash the grinder *thoroughly* with lots of hot water and soap. AN and moisture react to rust metal objects so fast and so badly that if the grinder sits for a couple of days before washing it, it may be rusted beyond repair.

In my previous work, *The Advanced Anarchist Arsenal*, I wrote of an explosive propellant called Ammonpulver. Composed of 85-percent AN and 15-percent charcoal powder, it forms a very powerful low explosive. In recent research, I have found indications that Ammonpulver may be detonated with a blasting cap, though I have never tested it in this manner.

The IMP listed an explosive made from 4 parts finely ground AN and 1 part aluminum powder. It is such a simple mix that it has been overlooked for the most part by serious users. My research has found that an almost identical compound composed of 82-percent AN and 18-percent aluminum powder was rated as having 90 percent of the power of blasting gelatin. This would make it one of the most powerful of improvised explosives. The AN must be powdered and dried at very low oven temperatures before mixing with the aluminum and *must* be protected from moisture. This is essential, as moist AN in contact with aluminum generates hydrogen gas. This can and has caused explosions in canisters of this type of explosive.

Homemade AN Gel Explosive

This is an easily made explosive mixture which may be detonated by a No. 6 blasting cap. It is roughly equivalent

in power to 60-percent nitroglycerin dynamite. Its storage life is uncertain, so it should not be made up more than a month before use. It will swell and generate gas in storage. The addition of a retardant and buffer package will greatly extend the storage life to at least a year.

CHEMICALS NEEDED FOR A 1-POUND CHARGE

CHEMICAL	AMOUNT (GRAMS)	PERCENTAGE of total
AMMONIUM NITRATE	250	55
POTASSIUM NITRATE	45	10
ALUMINUM POWDER	68	15
SUGAR	23	5
GUAR GUM	11	2.5
BORAX	4.5	1
WATER	68	15

Separately grind and sift all solid materials. Store in individual containers.

1. Mix the guar gum and potassium nitrate together.
2. Place the AN in the mixing bowl. Heat the water to boiling and pour it into the container, stirring until all of the AN is dissolved.
3. Add the two mixtures together and stir for a few minutes.
4. Add the aluminum and sugar. Stir until mixed evenly.
5. Dissolve the borax in a couple of tablespoons of water and stir into the mix. Continue stirring until a smooth mixture is obtained.
6. Pour the mixture into the mold or charge container and place in a warm box to gel. The explosive is now ready to use. NOTE: The guar gum may be replaced by starch or gelatin, if necessary, but guar gum gives better gels. It is available at some health food stores.

When boiling water is added to the AN, the operative will notice that the solution will turn cold. This is the same endothermic principle used in portable ice packs. (Therefore, such cold packs are a "sterile" source of high-purity ammonium nitrate.)

Make this explosive in a well-ventilated area or, at least, under the exhaust fan of a stove. Unlike many other explosives, its manufacture does not emit noxious fumes, but it *does* give out a distinct ammonia odor similar to baby piss. It isn't dangerous, but some people find it annoying. (Wives, for instance.) For this reason, also, seal up the explosive in jars, cans, or sealed plastic wrapping. If tin cans are used as containers, the insides must be coated with a plastic sealer. The AN in the gel can react with the tin coating on the can and produce sensitive explosive compounds that are dangerous.

The addition of three chemicals will greatly enhance the storage of the explosive. The retardant, which reduces gas formation, is urea, a common gardening chemical. It is used in a percentage of .5 percent, or 2.25 grams per 1-pound charge. The buffer is made by mixing 100 grams of monobasic potassium phosphate with 1 gram of powdered lye. Place the chemicals in a jar and shake for several minutes to mix them completely. One and a half grams of this mix, or .3 percent of the total charge weight, will be needed. These chemicals are added after all the others have been mixed in and before warming.

An excellent warming box can be made from a wooden box and a pistol-style blow dryer. Cut a hole in the lower part of the box for the blow dryer and another hole in the top for an exhaust port.

GUNCOTTON

Guncotton (GC) was the first militarily useful high explosive. It was widely used in the late nineteenth and early twentieth centuries both for demolitions and as a filler for torpedoes and naval mines. When used wet it was very safe and insensitive, yet easily detonated using a priming charge of dry GC. It fell out of vogue when TNT and picric acid became widely available, but wet GC slabs were used by the British army for demolition purposes until late in World War II.

While guncotton can be easily made by nitrating cot-

ton with a mixture of nitric and sulfuric acids, the resulting material is often unstable due to the difficulties involved in removing all of the trace acids. Cotton fibers are essentially tiny tubes that serve to trap the acids inside. Improperly purified GC can become *extremely* dangerous with age, often resulting in spontaneous explosion. When it was initially discovered in 1840, it aroused great interest as a replacement for gunpowder in blasting. After several factories in Europe exploded due to improper purification, it was discarded for the next 30 years until a reliable method of purification was discovered.

Homemade guncotton next to the M-6 cannon powder it was made from.

What follows is a simplified method of extracting guncotton from common single-based gunpowder, in which it is the primary component. The resulting material is of high power, detonating at a rate of 7,300 mps dry and 5,500 mps wet. Military surplus single-base powders frequently come on the market at *very* attractive prices. I recently came across 8-pound canisters of M-6 cannon powder for $12!

This is an excellent method of producing a comparatively inexpensive military-quality high explosive from a common low explosive.

Dry GC may be compressed into pipe bombs or other ordnance for use as a low explosive and will be many times more powerful than the original powder it was made from. In fact, if conditions are right, compressed dry guncotton can make the transition from deflagration (rapid burning) to full-scale detonation very quickly.

Guncotton Preparation

1. Place 1 pound of single-base powder into a jar and cover with about twice as much acetone. The powder will dissolve until the entire mass is a thick syrup resembling cold molasses.

2. Fill a blender about half full of cold water and pour one quarter of the jellied powder into it. Blend at high speed for several minutes. A coarse green material resembling fiberglass will float to the top. This is guncotton.

3. If wet GC is the goal, pour the mass into a coffee filter and squeeze out as much of the excess water as possible. Spread the filter on several layers of newspaper and allow to dry thoroughly. A heat lamp will help to speed this process, but nothing hotter.

4. Weigh the dried GC. A small percentage of the stabilizers and other chemicals in the powder may have been lost in the water/acetone wash. How much depends on the type of powder used. Distilled water should then be added at a ratio of 3 ounces water per 16 ounces of dry GC. The material can be pressed into bricks and stored in plastic bags. (A British 1-pound—19 ounces actual weight—demolition slab was 6 x 3 x 1 1/2 inches in size.) It may also be pressed into jars and cans for storage.

5. If dry GC is desired, drain off as much of the water from the blender as possible. Operate the blender on "grind" for several minutes, and use a plastic or wooden stirring rod to ensure that all of the GC is ground into a pulpy mass. The GC must be moist when ground. Dry gun-

cotton is sensitive to shock and friction, so it would be extremely dangerous to perform this step on dry GC.

6. Remove the pulpy mass from the blender and dry as above.

When completely dry, the GC may be compressed into pellets or cartridges using an improvised hydraulic press. The pellets may be given a quick dip in acetone to waterproof them. The acetone converts the outer layer of the GC into a form of celluloid, which is impervious to moisture. This outer shell will be a bit on the brittle side, and care must be taken to prevent it from being chipped. If damaged, moisture may enter the pellet and render it insensitive to initiation by a blasting cap. If full-sized cartridges are made, they may be enclosed inside a condom for their protection.

NOTES: Dry GC is sensitive to impact, friction, and sparks. In its pure state it is about as sensitive to impact as mercury fulminate or lead azide. The reprocessed form is a bit less sensitive but still should be handled carefully. It will detonate when struck by a rifle bullet. Likewise, extreme care should be used when pressing it into pellets or cartridges. All compression should be done slowly and carefully, using wooden and plastic molds.

CO-OP SUGAR

This compound has long been a favorite of the Provisional IRA. Composed of a simple mixture of 10 parts sodium chlorate and 1 part nitrobenzene, it is comparatively cheap, easy to make, and cap sensitive. They prefer to use it in their large car and culvert bombs, as it offers substantial increases in power over ANFO and is just as easy to make. It is roughly equivalent in power to 50-percent dynamite. Sometimes detonating cord is laced through the mixture in an effort to boost its velocity of detonation.

CO-OP sugar is based on a late-nineteenth-century commercial explosive called Rack-a-Rock, which was used extensively in that period. Rack-a-Rock was invented in

1881 by Silas Divine, who went on to patent a large number of two- and three-component explosives based on potassium chlorate. A few are listed below.

3-4 parts potassium chlorate
1 part nitrobenzene

3-4 parts potassium chlorate
1 part nitrobenzene
1-3 percent sulfur (added *after* the other two parts are combined, usually by dusting the outside of the cartridges)

8 parts potassium chlorate
1 part turpentine

Another mixture of this type was reported to be 9 parts chlorate and 1 part kerosene. Either sodium or potassium chlorates may be used, but the potassium compound will be slightly more powerful. SC is more hygroscopic, however, and so must be protected from moisture prior to the "soak," but then again, it costs only slightly more than half of what PC does.

SC may be found in "Solidox" oxygen pellets used in the home welder of the same name. They consist of about 80- to 90-percent SC and 10- to 20-percent catalyst and fiberglass binder. The crushed pellets, soaked in various flammable liquids, have turned up in several IEDs over the past few years. In fact, a fairly good explosive can be made by simply soaking the required amount of nitrobenzene into the pellet. Theoretically, most liquid hydrocarbon oils, such as gasoline or diesel, should work in this type of explosive.

The primary problem is one of volatility. If the explosive is sealed in an airtight container, as CO-OP sugar usually is, this ceases to really matter. Due to the toxicity of nitrobenzene, this is a good idea anyway. Never allow this liquid to touch skin, and don't breathe its vapors for very long.

The level of power of the various mixtures will have to be determined by testing. No hard data on this factor has been found.

In Rack-a-Rock, the potassium chlorate was crushed or powdered and pressed into cartridges about the size of dynamite sticks. These sticks were then wrapped in cloth or porous paper. When ready for use, they were placed in a wire basket and lowered into a pail of nitrobenzene, where they were allowed to "soak" for a period of 3 to 6 seconds, depending on the diameter of the cartridge.

SHEET EXPLOSIVES

The earliest sheet explosive was patented in 1889 by ordnance designer J.W. Graydon. It consisted of a sheet of felt or cotton cloth soaked in nitroglycerine and sealed in a parafinned paper cover. Commercial sheet explosives were developed by Du Pont in the early 1960s. Consisting of 85- to 80-percent high explosive and 20- to 15-percent elastrometric binder, they are used primarily in commercial blasting for steel cutting, explosive bonding, and in small booster charges. The U.S. Army uses it as the M-118 and M-186 demolition charges for steel cutting exclusively.

Sheet explosives possess high power, are capable of being tucked away in the most unlikely of places, and have a very low vapor pressure. Abu Ibrahim used a homemade sheet explosive composed of about 80-percent PETN and 20-percent binder (believed to be based on rubber cement), backed with a cheeseclothlike material for strength.

The following materials are required:

1. Explosive—Either RDX or PETN is suitable, but the latter is preferred, as it is easier to detonate.

2. Binder—The binder consists of a solid rubberlike material dissolved or suspended in a solvent. The amount to be used is based on the solids content. This may be determined most simply by weighing out a 10-gram sample and allowing it to harden fully. It is then weighed to determine how much of the weight in solvent was lost. The amount needed is calculated based on this loss. Several different materials are suitable as binders.

A. Rubber Molding Compound—Available from hobby

shops and some hardware stores. Usually consists of the molding compound and a catalyst. Follow the directions on the label for mixing.

B. Liquid Latex—Commonly used in stage makeup, it is probably the best due to its use of nontoxic, nonreactive solvents. It is *quite* expensive, however. Small amounts sell in theatrical supply houses for about $3 to $5 per 2-ounce bottle.

C. Rubber Cement—Another good choice and commonly available. Try to find one that uses nontoxic solvents if possible.

D. Clear Silicone Sealant—A common caulking material that is cheap and readily available. There has been some concern that the residual acetic acid used as a solvent in this material may cause storage and reactivity problems. PETN in particular is very sensitive to acid contamination, so this is a valid concern.

The density of the sheet will be about 1.4 gm/cc.

NOTE: Only those types made from the latex or rubber cement should be vulcanized, as in the example that follows.

This example uses rubber cement as its binder. The type used was composed of approximately 12-percent crepe rubber dissolved in heptane. After initial test batches are made and experience is gained in mixing the explosive, it will probably be easier to measure the binder by volume rather than weight. A few-percent difference either way will make little difference.

A small amount (1 to 2 percent of binder *solid* weight) of sulfur is added as a vulcanizer. This addition, along with the heating, will give a much tougher and more resilient product. The cloth backing used by Abu Ibrahim will not be necessary. The resulting explosive will comprise 85-percent high explosive and 15-percent binder, by weight. It is strong, versatile, and can be initiated by a No. 8 blasting cap, even in sheets as thin as 1 millimeter.

Production

NOTE: The heptane solvent used in the rubber cement is very flammable, as are its fumes. All mixing must be done

(No Model.)

J. W. GRAYDON.

HIGH EXPLOSIVE CHARGE.

No. 399,883. Patented Mar. 19, 1889.

Fig. 1.

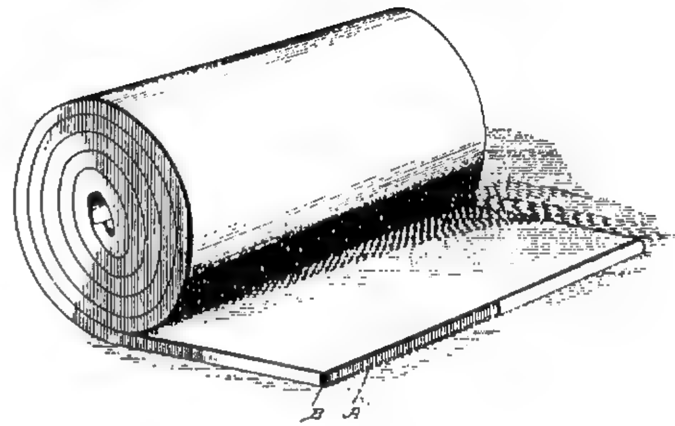
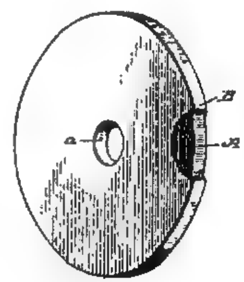


Fig. 2.



Witnesses.
Albert Speiden.
Robert Owens

Inventor
James W. Graydon
By his Attorney
Wm Hunter Myers

in a well-ventilated area away from any source of spark or flame.

1. Weigh out the required amount (85 percent) of explosive and pour it into a stainless steel mixing bowl. Add just enough water to wet it down completely and pour off any excess.

2. Add the sulfur vulcanizer and mix throughout the explosive.

3. Add the binder (15 percent) to the wet explosive, pouring it as evenly as possible over the crystals.

4. Use a plastic spatula to stir and fold the mass until a homogenous mixture is obtained. The mixture must be stirred and folded continuously as the solvent evaporates. Since the solvent comprises 88 percent of the initial binder mass, this may take awhile. The best way to speed this process up is to perform it in front of a strong fan (blowing *away* from you).

5. When the explosive mixture has thickened considerably and has lost most of its tackiness, transfer it to a flat sheet of safety glass and roll it into a flat sheet. Use a putty knife or spatula to square up the sides and ends. Let the sheet cure overnight.

6. Place an identical sheet of safety glass over the sheet and clamp them together with carpenter's clamps. Place a heating device, such as a flat iron, in the center of the glass sheet for about 15 minutes. The sheet must attain a surface temperature of at least 50°C for proper vulcanization. Adjust the iron temperature so that it doesn't exceed 100°C for safety's sake. Remove the heat and let it cure overnight.

7. Peel the explosive sheet off of the glass and store in a cool dry place until needed. It may be wrapped in plastic wrap to keep it from becoming soiled.

NOTE: A 500-gram sheet would be a mix of 425 grams explosive, 637.5 grams rubber cement (12-percent rubber, or 76.5 grams solids), and 1 gram sulfur.

HOMEMADE PLASTIC EXPLOSIVE

A good quality, reliable plastic explosive, suitable for all

types of work, can be made easily at home. It is made from a mixture of a high explosive and Vaseline. The preferred base explosives are RDX or PETN. This particular mix is based upon the original Composition C but would work equally well for the production of Semtex-type explosives. Simply use half RDX and half PETN, and substitute a vegetable oil for the Vaseline.

1. Spread the explosive crystals evenly in the pan heater. Allow to heat for a few minutes to drive off any moisture.

2. Pour the melted Vaseline over the crystals. Allow a few minutes for it to distribute itself evenly throughout the crystals.

3. Stir and fold the mixture with a plastic spatula to ensure even mixing.

4. Remove the mixture from the pan onto a flat, smooth surface. A sheet of auto safety glass will work perfectly, especially if placed over a heating pad to warm the surface. This makes blending easier.

5. Using a rolling pin, roll the explosive mixture as flat as possible, applying moderate to heavy pressure. This process is known as milling.

6. Use a spatula to lift the sheet from the glass and fold it over itself several times. Repeat step 5.

This process increases the density and consistency of the explosive and will improve its performance substantially. While a simple hand-kneaded mixture will definitely explode, it will not approach the performance of the commercially made variety.

Once it's been rolled and folded several times, PE should be pressed into blocks or cartridges for storage. Blocks or slabs are probably the easiest to work with, but I have a fondness for the little 4-ounce sticks like the Brits used to use.

Since the density of an explosive has a direct bearing on its power, velocity, and consistency of action, care should be taken when packaging to include this factor. Knock-apart molds should be built to the proper dimensions to hold the volume of explosive at its proper density. For example, for

optimum power Comp C should be pressed to a density of about 1.6 grams per cubic centimeter. Say the packages are to contain 500 grams of explosive:

500 grams (explosive weight)
÷ 1.6 (density-grams/cc)
= 312.5 cubic centimeters of volume, which translates into a block about 50mm x 50mm x 125mm (a handy size indeed).

If the operative does not want to work out the calculations, he can simply build a mockup mold of the approximate length and width he wants his block to be. It can be made out of practically anything, since it will only be used briefly for measuring purposes, but it needs to be waterproof. Carefully measure a volume of water equal to the number of cc's required (1cc = 1ml). Mark the depth of the water and build the real mold to these dimensions. Simple, no? This technique really pays off when measuring a tube's volume for pressing sticks.

1. Weigh out the required amount of premilled explosive and place it on the warm milling glass. Let it get good and soft, but not so hot that the petrolatum starts to exude.

2. Place strips of the warm PE into the mold, filling it evenly. Press it in by hand, if necessary.

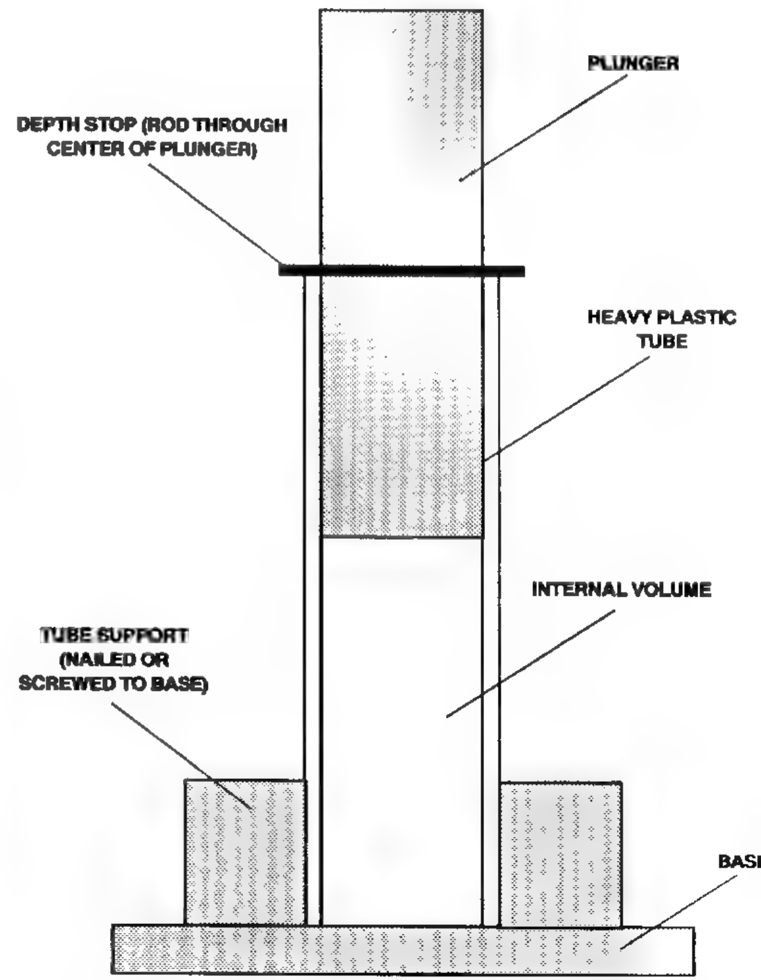
3. Place the cover on the mold and press until the cover is completely closed. This will give a block compressed to the proper density.

4. Remove the cover and sides of the mold and expel the block. This will be easier if the explosive is allowed to cool down first.

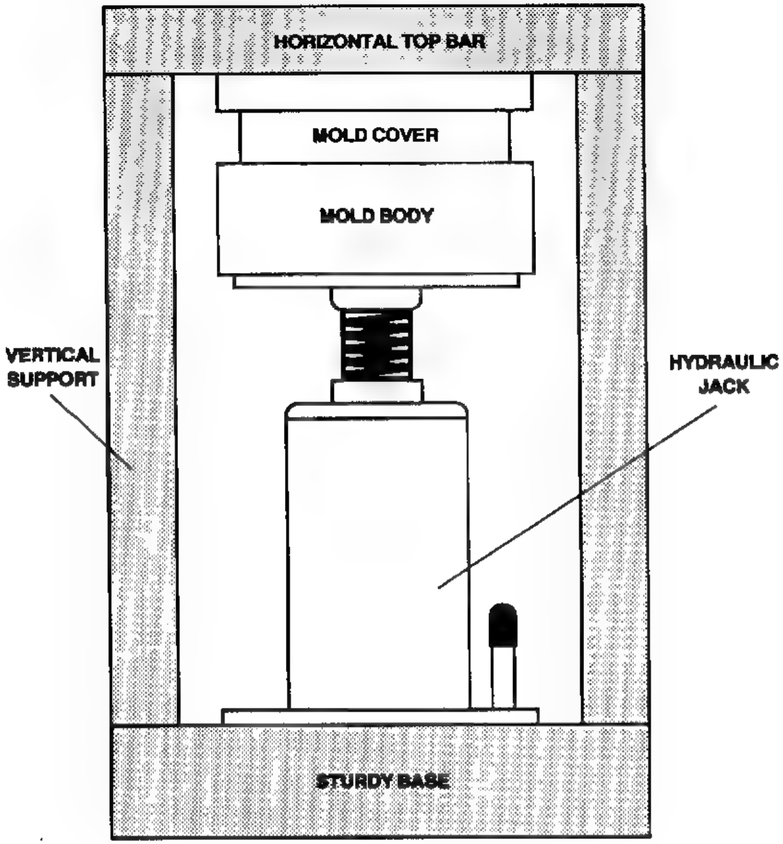
5. Package the block by wrapping it in grease paper or sheet plastic and taping the seams securely. A good alternative is Ziplock plastic bags.

Sticks are made in the same manner but are expelled from the tube by using a longer piece of dowel with the same diameter as the plunger.

Remember, plastics made by this process are heat sensitive—they will get soft and ooky at high temperatures. They will not, however, become unsafe to use, just a bit messy. Be aware that oozing binder has given away more than one infernal machine. Plan accordingly and store the completed product in a cool, dry place. Providing these two criteria are met, shelf life is indefinite.



Cartridge Press



Hydraulic Cartridge/Block Press

The press should be of all-steel construction and all corners bolted or welded. It must be strongly built to withstand the pressures involved. If too weak, the jack will push the horizontal bar right off of the top.

PICRIC ACID

This process is a scaled-up version of the one Barry Rothman developed for the IMP Handbook. It is by far the quickest and easiest method for picric acid production but is also one of the more expensive for large-scale production.

Using this process and retail materials, a pound of PA will cost about $40. This price can be reduced drastically if one takes the time to ferret out discounts or purchase the materials in bulk. Comparative shopping is the order of the day, but remember what I said about special orders. It *will* produce about a quarter of a pound of picric acid per batch from *readily* available materials.

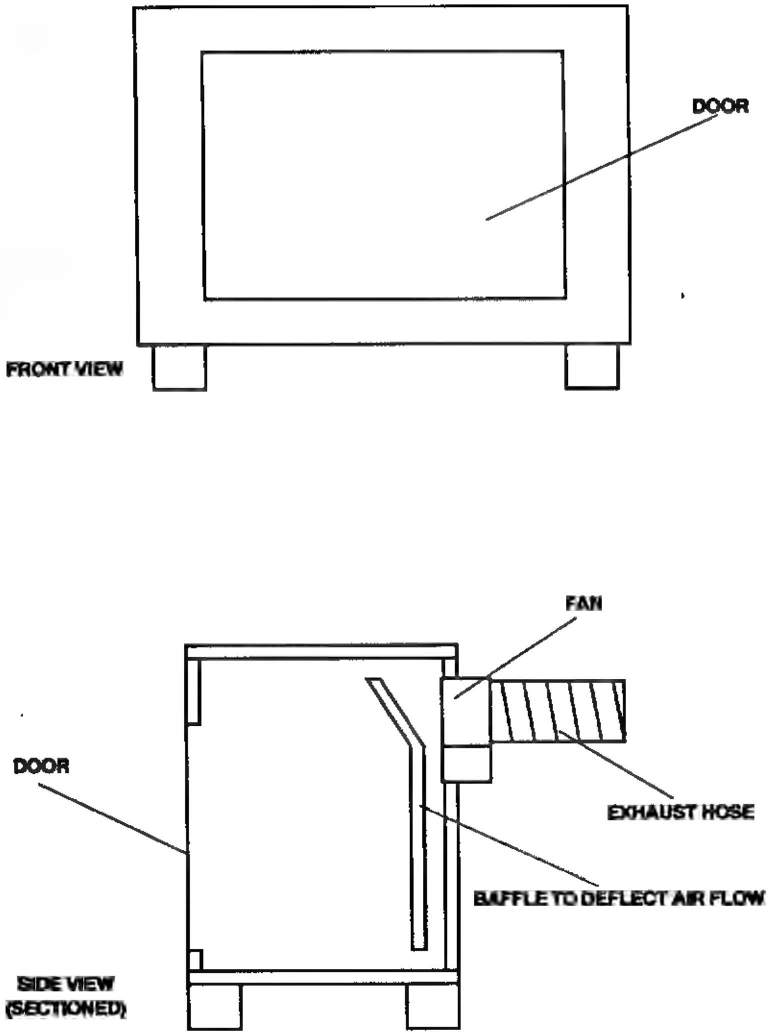
Materials needed are:

1. Concentrated Sulfuric Acid—The best place to locate this acid is at a local hardware store, where it can be picked up for use as a drain cleaner. The price is around $12 a gallon. Check on price breaks on case quantities.
2. Potassium Nitrate—May still be found at some drug stores or vet suppliers as a diuretic or in hardware stores as a stump remover.
3. Aspirin—*Always* buy the cheapest, lowlife, no-brand grade. Besides the obvious economic reason, the cheapos don't contain the fillers and coatings that will require purification before use. Prices will vary widely, so shop around.

To produce picric acid:

1. Crush 500 aspirin tablets into a fine powder. A small coffee grinder works perfectly.
2. Pour the powdered aspirin into a gallon glass jar containing 2 liters of sulfuric acid.
3. Place the jug in a simmering hot water bath and heat for 15 minutes.
4. Remove the jar from the bath and stir it vigorously to make sure that all of the aspirin has dissolved. The solution will gradually turn black.
5. Place the jar into the fume hood and turn on the fan.
6. Add 300 grams of potassium nitrate to the acid in three 100-gram portions. Stir vigorously between additions. The solution will turn a dark yellow-orange color.
7. Allow the solution to cool to room temperature, stirring occasionally.
8. Remove the jar from the fume hood and slowly pour the solution into a bucket containing about 2 gallons of *cold* water. Always wear gloves, goggles, and apron. Not only

are the crystals toxic, but they will leave a pretty yellow stain on just about everything they contact.



Fume Hood

SPECIAL NOTE: When the potassium nitrate is added to the acid/aspirin solution, the reaction will generate copious quantities of red nitrogen dioxide gas. Since this gas can be quite toxic, it must be vented away from the work site; hence, the fume hood. The appearance of the dreaded "red gas" is a major danger signal when making most other explosives, such as nitroglycerin, but is perfectly normal for this one. I wish someone had told me of this before I made my first small batch. Scared the *hell* out of me.

An excellent explosive can be made from picric acid by mixing 88 parts PA with 12 parts wax, using the same process covered in the chlorate explosives section. The grained explosive is then pressed into cartridges. It is easily detonated by a No. 8 blasting cap but is much less sensitive to shock, less reactive with metals, and less toxic to handle than the pure material.

The fume hood will come in handy for making many different explosives and is definitely worth the cost of construction. It can be built out of sheetrock or 3/4-inch plywood.

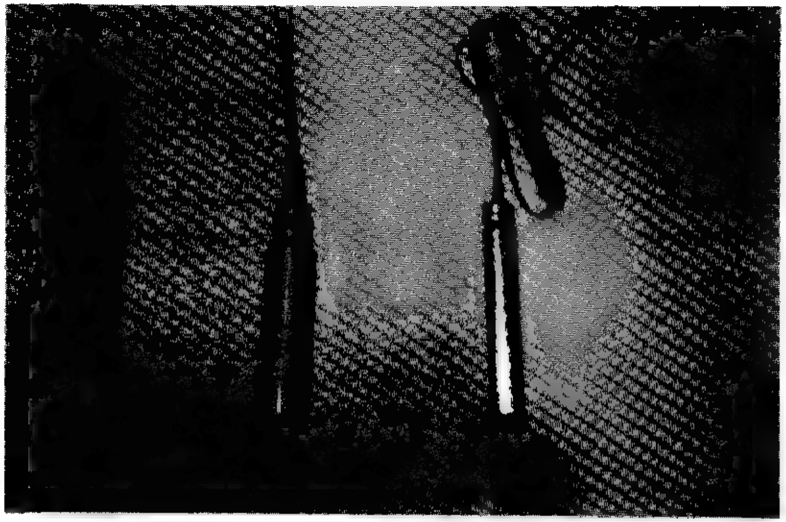
CHAPTER 6

HOMEMADE ELECTRIC DETONATORS

We have already covered several types of homemade high explosives, and since a high explosive is useless without a detonator, it would seem appropriate at this time to discuss how to make up homemade detonators. The det is the most sensitive part of the high-explosive primer, but if the operative exercises proper care and due caution, he can safely assemble dets almost as good as the "store bought" kind. I will describe how to make one type of electric detonator using an empty .223 cartridge case for its shell.

Many different types of materials have been used for homemade detonators. The IRA favors one made from a piece of 1/2-inch copper pipe containing 2.5 grams of mercury fulminate, ignited by a flashbulb. Plastic tube detonators have turned up recently, and the Soviets have been using cardboard-cased detonators since World War II. The IMP outlined the production of a cartridge case detonator, but I prefer one modification they don't—I saw off the rim portion and thin down the base with a file until it is the same thickness as the rest of the brass casing.

Tests conducted during the development of the IMP showed that misfires occurred when the base charge was loaded in the primer end of the cartridge case. Though the reason for this was never fully investigated, I believe it was due to the thickness of the brass in the base, which in most cases is 4 to 5 times as thick as the sides of the case. The IMP solved this problem by feeding the fuse cord through the primer hole and leaving the mouth of the case open. Thinning the base and sealing the igniter match in the neck provides a more secure and durable package.



Electric detonators, left to right: IRA copper pipe det, det made from .223 cartridge case, commercial No. 8 blasting cap.

Chapter 7 Miscellaneous Applications and Techniques

BODY BOMBS

The body bomb is an explosive charge made to be strapped to the torso and concealed under the clothing. Plastic explosives are the most commonly used types, but plain old dynamite may be rolled flat to make a compact package.

This type of device originated, as did many explosive innovations, with the Irish rebels. O'Donovan Rossa's Skirmishers employed three bombs of this type in their attack on the British House of Commons in 1885. Three vests were prepared, 24 inches long, 15 inches wide, and 1 1/2 inches thick, containing slabs of Atlas dynamite. They were made to be worn under heavy overcoats, as was common for that time and climate. Heavy rubber straps were used to attach the bombs to the bodies. There has been some speculation that one of the bombs was worn under a long skirt by a female accomplice.

The West German RAF used an updated version in the early 1970s that was made to simulate the protruding belly of a pregnant woman. Upon arrival at the target site, the bomb was removed from its carrying harness and emplaced. Under the bomb was a bladder made from a soccer ball, which was inflated so as to disguise any changes in the bomber's figure that might be noticed during her exit.

The most recent manifestation of the body bomb was used in the assassination of Indian Prime Minister Rajiv Ghandi. A woman, dressed in the bright orange and green colors of Ghandi's political party, approached him bearing

a bouquet of flowers. Strapped to her back, in a homemade denim belt fastened with Velcro straps, were an estimated three sticks of high-velocity gelatin dynamite. As the PM approached, she bowed low to present her gift. When he bent over to accept it, she detonated the bomb.

My all-time favorite deception was the one used by the OSS on its "Mole" antirailroad mine. The bomb was mounted to the railway car by agents and was designed to fire when the train entered a tunnel. On the side of the box was a decal which boldly stated, in German, "This is a Car Movement Control Device. Removal or tampering is strictly forbidden under heaviest penalties by the Third Reich Railroad Consortium. Heil Hitler." Get my drift?

CAR BOMBS

The use of car bombs has proliferated over the last 20 years until it seems that no region of unrest has been spared their devastating power. IRA public-relations claims notwithstanding, Northern Ireland was not the birthplace of the car bomb. Neither was Palestine, where it was used by Arabs and Jews alike during the bloody period just prior to the birth of Israel. No, the car bomb was an American first, one which spawned the Red Scares of the 1920s.

On September 16, 1920, a lone driver parked what was believed to be a delivery wagon in front of one of the many banking institutions that line Wall Street in New York City. Amid the usual hustle and bustle of commerce in this area, he dismounted from his wagon and slipped away unobserved. A short while later, the wagon, which contained an estimated 100 pounds of dynamite, detonated. The damage was horrendous—in addition to the explosive, the bomber had packed the charge with hundreds of pounds of lead sash weights, all carefully cut in half, as shrapnel. The final toll was 39 killed and hundreds injured.

The main reason for using a car bomb is to get a large charge of explosive in close proximity to its intended target. The IRA has a practice of kidnapping the family of an

employee of their intended target and forcing them to deliver the bomb to the target. The bombing of the French Embassy in Beirut was accomplished in a similar manner the bomb was concealed in the vehicle of an embassy employee without her knowledge. Once she was waved through the gate and had parked inside of the compound, the bomb was detonated. These are known in the trade as "proxy car bombs."

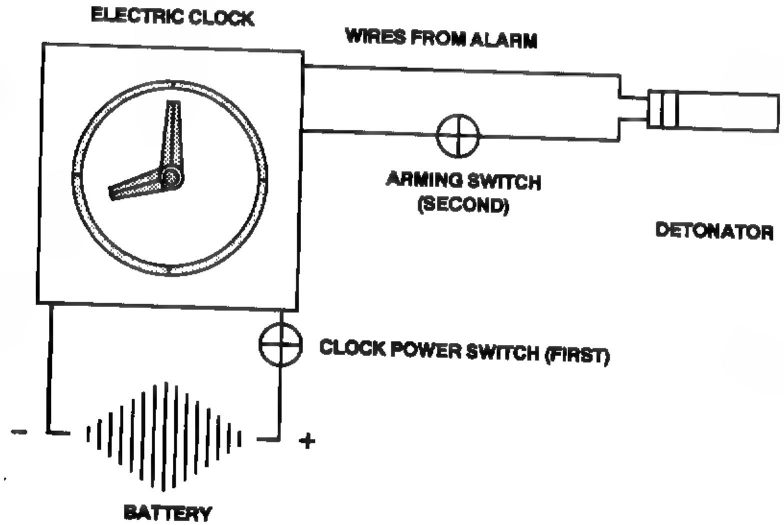
The widespread use of car bombs in some parts of the world has led to extreme countermeasures in some locales. In Beirut, unattended vehicles are likely to be picked up by remote-controlled forklifts and dumped over a seawall into the ocean.

The best type of vehicle for use as a car bomb is a standard passenger van, although in some cases a family car with a roomy trunk is adequate. Though the transport used is normally a "throwaway," it *is* possible to off-load a bomb in certain circumstances and escape in the transport vehicle. (I suspect that this was what was intended in the World Trade Center bombing, but things didn't work out.) A Jewish underground group in Palestine had a habit of driving into the Arab Quarter of Jerusalem in a panel truck, off-loading a fragmentation bomb made from a 55-gallon drum, and escaping. Stolen vehicles taken especially for the job are often used. The innocuous delivery trucks one sees everywhere are so common as to be practically invisible.

The use of this type of bomb also means that a cheap, improvised explosive must be employed. High-powered explosives such as TNT or C-4 should be saved for those times when their high bulk strength is needed. ANFO is, of course, the most obvious candidate, since it costs about $15 to produce 100 pounds of the explosive, and the ingredients are readily available. ANFO can use a bit of confinement to improve its blast. Sturdy metal drums with removable lids serve the purpose admirably. Anything from the small 5-gallon tins with friction lids to the mammoth 55-gallon chemical drums with locking ring lids are suitable; in fact, the latter have turned up in

several recent bombings. A 55-gallon drum can hold close to 300 pounds of an ANFO-type mix.

Riding en route to deliver a car bomb to its target can be nerve-wracking to say the least. Sitting atop a couple of hundred pounds of fuzed high explosive is not conducive to mental tranquillity, so it is best not to have the fuze activated until it is at the target site. Once on target, a fuze should require a minimum of manipulation to arm. A battery-powered analog alarm clock is best employed for this purpose.



Car Bomb Fuze Circuit Drawing

The modifications are simple. Mount the clock in a sturdy box, wire a toggle switch to its power supply to act as an on-off switch, and a second toggle switch from the alarm buzzer to the detonator wires to act as an arming switch. It is best to "jump" the contacts on the buzzer rather than remove it, as this will act as a safety. When the clock power is turned on, the buzzer will warn if there is power to the

detonator wires *before* the second arming switch is thrown. Ordinarily, the buzzer used in this type of clock supplies adequate voltage to detonate an electric cap. If not, an SCR circuit will have to be wired into the buzzer.

Before the bomb is delivered, the alarm and dial of the clock need to be set to the desired delay. For example, if a 30-minute delay is required, the clock needs to be set at 12:00 and the alarm at 12:30.

Once on site, the clock power switch is flipped. The hands will start turning and the countdown has begun. If the buzzer doesn't sound, the second switch is flipped. The bomb is now completely armed.

Viet Cong guerrillas sawing a U.S. bomb open to remove the explosive charge. The guerrilla on the extreme right holds a pot of water for use as a coolant and lubricant during the cutting operation.

DEFUZING HIGH EXPLOSIVE ARTILLERY SHELLS

Since most artillery shells have a comparatively low explosive content in relation to their weight, it is best to use them as fragmentation bombs. The specially treated metals

used in their construction allow them to break up into many small fragments. To use them most effectively, the fuze must be removed from the nose of the round.

Some types of shell come unfuzed, with a shipping plug sealing the fuze well. To remove a fuze safely, a fuze wrench is required. This is a rather specialized piece of equipment unlikely to be found at the local hardware store. Fortunately, it is not too difficult to make.

Viet Cong guerrillas removing explosives from a dud American bomb.

Measure the distance between the two "flats" on the fuze. Cut out the shape of a common open-end wrench of this dimension from a flat piece of 1/4-inch steel plate and weld on a piece of pipe for use as a handle. This wrench is indispensable for removing fuzes. Do not be tempted to use something like a pipe wrench just because it fits. Though this would most likely work, it would be subjecting a delicate mechanism that contains several types of sensitive high explosives to a crushing pressure. Does this sound like a good idea? I'm glad we agree. This procedure is suitable only for *unfired* shells. It is not to be performed on dud

(fired, but unexploded) ordnance. The fuze on a dud is armed, and this procedure would be very dangerous.

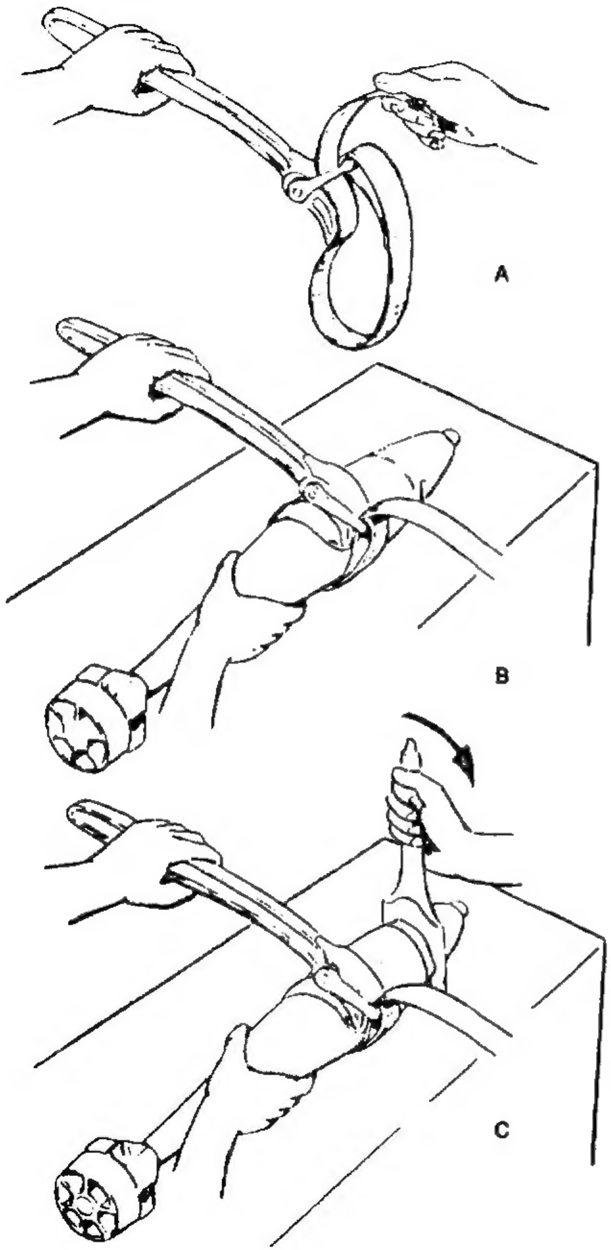
First, securely tape all of the arming wires and pins on the fuze. It wouldn't do to have them drop out at an inopportune moment. Place the shell on its side on a sturdy bench.

Two people are needed to remove the fuze—one to hold the strap wrench and the other to unscrew the fuze. Secure the strap wrench around the body of the round. Depending on the diameter of the shell body, an oil filter wrench may be used if it's properly modified with padding and an extended handle. One person holds the strap wrench with one hand while using the other hand to stabilize the round. The second person fits the fuze wrench into place and gives it a strong pull in a counterclockwise direction. It may be necessary to give the handle of the fuze wrench a smack with a wooden mallet to loosen it. *Take care not to strike the fuze!* Even though it is quite safe with all of its safety wires in place, due caution should be exercised.

Unscrew and remove the fuze. Unscrew the booster cup from the bottom of the fuze and dispose of the fuze body. Even though it still contains a small detonator that could prove useful, further disassembly by a nonexpert is not recommended. The booster cup contains an ounce or two of a relatively sensitive high explosive which should be reused. This explosive is usually RDX or PETN. These two explosives are the U.S. standard for boosters, though RDX seems to be used more widely. Both are white crystalline materials resembling salt.

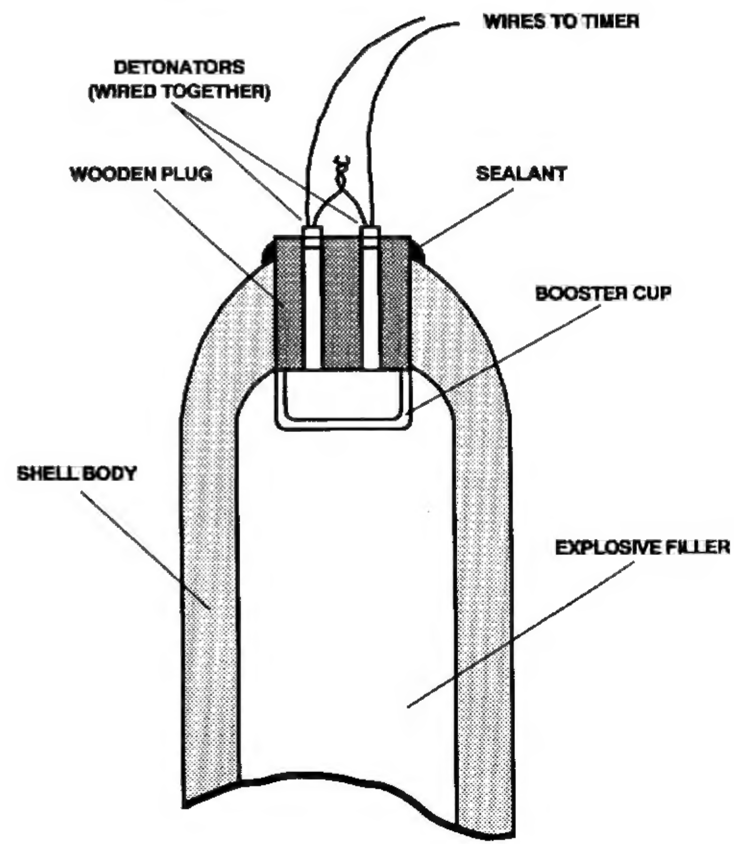
A third booster explosive, tetryl, may be encountered in older ammunition. Tetryl was a favored booster explosive for many years but was discontinued because of its tendency to exude from the booster when stored in hot climates. It is a yellow crystalline solid.

Feel the surface of the explosive. If it feels slightly waxy, warm it under a heat lamp to see if it softens up. If so, scoop it out and store it in a jar under a bit of water until a useful amount has been collected. If it feels hard



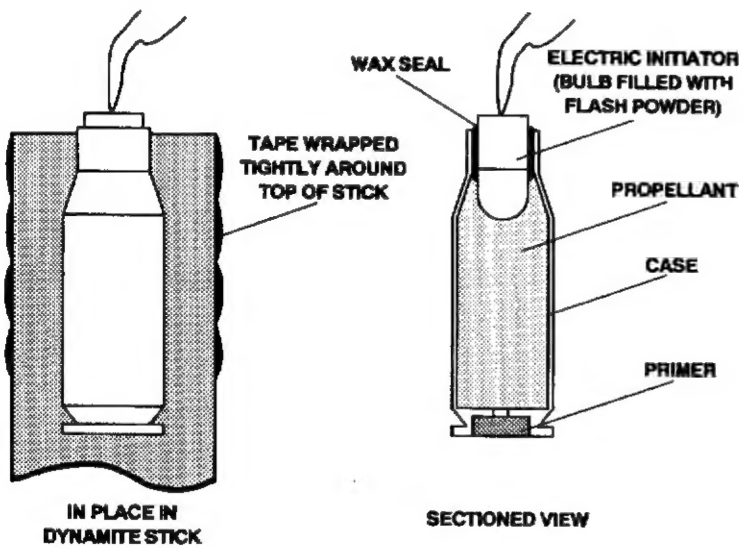
Removing the Fuze from a Mortar Shell

and chalky, place the booster cup in a jar and cover it with warm acetone. Both RDX and PETN are soluble in this solvent. At the very least, this treatment should soften up the explosive so that it can be scooped out with a wooden stick. If too much solvent is used, all of the explosive will go into solution and the acetone must be evaporated to recover it. This should be done in any case, as some of the explosive will be dissolved in it. Acetone vapors are flammable, so be sure to do this in a well-ventilated area. Store the recovered explosive under water until a sufficient quantity is collected, then dry for use.



Priming an Artillery Shell

Once the fuze has been removed, priming it is easy. Pack the fuze well with plastic explosive and press a blasting cap into its center. If the charge is to be stored for a time, just pack in the PE and seal the well tightly with tape. This cover can be pierced with a pencil when ready to prime. If there is no plastic explosive, replace the booster cup into the fuze well and wedge a wooden plug into the top. The plug is predrilled in the center to accommodate a blasting cap. The end of the cap must be in direct contact with the explosive in the booster cup. To be on the safe side, drill two holes in the plug and use two blasting caps. Attach the shell to a board or other sturdy base with wire or tape to stabilize it.



Fused Blank Priming

When ignited, the bulb bursts, sending flame to the propellant powder, which in turn fires the primer. The primer explodes with a fair velocity down into the dynamite, causing detonation. The bulb should be sealed with wax only, as it should "pop" out of the case when pressure from the burning propellant is adequate. This prevents the cartridge case from bursting like a firecracker and scattering the dynamite before the primer explodes.

FUSED BLANK PRIMING

The technique of using fused rifle cartridges or their primers to initiate nitro-based dynamites is an old one, but it is still quite useful when proper blasting caps are unavailable or scarce. The primer in a large-caliber rifle cartridge is capable of initiating detonation in dynamites of at least 40-percent nitro content with a fair degree of reliability.

As this *is* a desperation technique, it is a good idea to "double prime"—that is, to prime two separate sticks. First punch a hole in the end of the stick that is *slightly* smaller than the diameter of the cartridge case and about 1/2 inch less in length. Press the cartridge into the hole until it reaches bottom, then push further while squeezing the top of the stick in your other hand. This will ensure that the rifle primer is in intimate contact with the dynamite. Tightly bind the end of the stick with friction tape to keep this "squeeze" on.

MILKING DYNAMITE

On occasion, the operative may come across a low grade of dynamite, such as 20 percent, and need a more powerful explosive. In this case, a useful but in my opinion totally unattractive option is "milking" the dynamite to extract its nitroglycerin content. Although this technique has been used by safecrackers for close to a century, it is definitely a desperation measure, and one should carefully explore all other options before attempting it. Frankly, I'd rather lick the soles of my boots after walking through a cow pasture.

Nitroglycerin is temperature stable up to about 50°C (122°F), so if the operative stays below this limit he increases his chances of survival. Heat a gallon glass pot of water to 50°C and remove it from the heat source to a remote work area. Remove the wrapper from the dynamite stick, place it in the foot of a nylon stocking, and tie the top. Dip the foot into the hot water and let it sit for a minute. Begin gently kneading the foot with gloved hands. The nitroglyc-

erin will seep through the mesh of the stocking and settle on the bottom of the container as a layer of pale brown oil.

After about 10 minutes of kneading, all of the NG should have been extracted. The stocking should contain some inert material that is not soluble in water. Most of dynamite's fillers are water soluble and will be in solution with the water. Remove the stocking and discard.

Allow the pot to cool to room temperature and *carefully* use an eyedropper to remove the layer of nitroglycerin from the bottom. NOTE: This will be easier if the operative *carefully* decants as much of the water from the container as possible and if it is tilted to allow the NG to pool up in the corner. He should try to take as little water as possible.

Place the NG into a jar containing a saturated salt solution to which a teaspoon of baking soda has been added. *Gently* swirl the jar for several minutes to allow all the NG to come into contact with the salt solution. This serves a double purpose—one, it neutralizes any acidity present (very important), and two, the salt solution removes residual water. Allow the jar to sit so that the layers separate, and carefully decant most of the upper (water) layer. Carefully remove the nitroglycerin off the bottom using the same techniques as mentioned before. It may now be processed into a more powerful dynamite or blasting gelatin, or it may be stored for future use. I don't recommend storing it for very long.

CHAPTER 8

RECOMMENDED READING LIST

The following list of books will serve to increase your knowledge about the principles, employment, and fabrication of explosives and / or explosive devices.

Explosive Principles by Robert A. Sickler (Boulder, CO: Paladin Press, 1992). This little book will enlighten you as to the physical principles involved in explosives and explosions. The author covers some pretty complex topics and issues in language anyone can understand. All of the whys, wherefores, and hows are explained in detail.

Home Workshop Explosives by Uncle Fester (Port Townsend, WA: Loompanics Unlimited, 1990). I recommend this book with mixed emotions.

First, the pluses. It is one of the best books on the preparation of high explosives I've ever seen. It is concise, readable, and thorough. The author is a former (?) illicit drug chemist who is well-versed in the operation of clandestine laboratories and their special problems. Especially valuable are his investigations into the manufacturing of the precursors of the explosives covered. He goes over any problems that are likely to arise and how to deal with them, both for safety's sake as well as for increasing yields. His chemistry is solid and well researched.

Fortunately, the minuses are few in this book, but they *are* significant. Where he falls down is in the utilization of the finished product. Stick to his manufacturing processes and you can't go wrong. Not a minor problem is the chapter entitled "Detonation Systems." I would advise you to read it once and then either black it out with a marker or glue the pages together. They border on insanity.

Counterbomb by Lawrence W. Myers (Boulder, CO: Paladin Press, 1992). This book looks at the job from a target's viewpoint. His work on detection and countermeasures is first-rate. The author has written several books for Paladin, and all are solid and well researched. We don't always agree on how certain things should be done, but this is not uncommon and doesn't affect the validity of his material. It's more a matter of different ways to skin the cat.

The Anarchist Arsenal and *The Advanced Anarchist Arsenal* by David Harber (Boulder, CO: Paladin Press, 1990 and 1991). Now, time for a shameless plug. These two volumes cover a wealth of formulas, devices, and advanced techniques used in the field of explosives. Naturally, they are among the best available. The author is a prince among men, as well as being good looking and a great lover.

Improvised Munitions Blackbooks, Volumes 1, 2, and 3 (Cornville, AZ: Desert Publications). All through the book you have heard me refer to something called "IMP." These books comprise the cream of the Improvised Munitions Program, which was conceived on the basis of a requirement issued by the U.S. Army Special Forces. The SF wanted a handbook containing instructions on the field improvisation of explosives and general weaponry. A lab team, headed by the legendary Barry Rothman, worked for close to a year researching and developing formulas and processes, and their completed report is the bible in the field.

The IMP yielded construction details on small arms, artillery, explosives, incendiaries—most all of the deadly toys necessary for modern warfare. However, I *do* have a great big caveat here—these books, while simply and clearly written, are not for amateurs or idiots. To safely and properly utilize them, the reader must possess a modicum (nay, a healthy dose) of common sense. Research all materials that will be used as much as possible so as to be cognizant of the potential hazards of some of the chemicals. The reader should begin with small amounts and work his way to larger batches as he becomes more experienced.

The *Blackbooks* were written 30 years ago. Items com-

monly available in the early 1960s may not still be around today, what with the government's unquenchable passion for protecting us from all harm. But used with prudence and caution, these books comprise a body of knowledge the operative shouldn't do without.